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CONTENTS

Topical Application of Penicillin in the Treatment of Vincent's Infection: *Kenneth R. Cofield, Everett W. Ferguson and Alfred E. Toye* ...

The Use of Penicillin in Clinical Dentistry. *Leonard Weiner* ...

Penicillin in the Treatment of Vincent's Infection. *Carlos F. Schuessler, James M. Fairchild and Irving M. Stransky* ... 551

Exposed Pulps of Teeth as the Portal of Entry for Poliomyelitis Virus. *Byron S. Aisenberg and Thomas C. Grubb* ... 555

Postwar Plans of Dentists in Service: I. General Findings. *C. Willard Camalier and Isidore Altman* ... 568

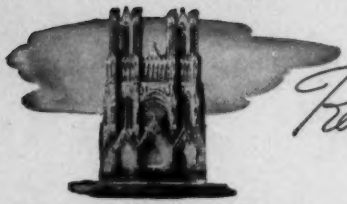
Early Incidence of Dental Need in Adults. *Henry Klein* ... 580

Further Testimony in Hearings on Naval Dental Bill ... 602

Editorials ... 615 Association Activities 620 Current Literature ... 636

Deaths ... 642 Announcements ... 645 Directory ... 647

MAY 1, 1945



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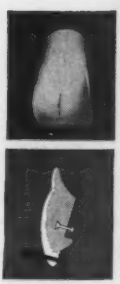

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TOPICAL APPLICATION OF PENICILLIN IN THE TREATMENT OF VINCENT'S INFECTION

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NUMEROUS articles have appeared in various publications concerning the history and chemistry of penicillin. In order to more clearly establish the background for its use in oral infections, a brief summary is presented herewith.

The drug penicillin was first discovered by Alexander Fleming (St. Mary's Hospital, London) in 1929. At the present time, the term "penicillin" is used to designate the active agent itself, whether in the form of a solution or in the form of a solid. Dr. Fleming said that penicillin might prove to be "an efficient antiseptic for application to, or injection into, areas infected with penicillin-sensitive microbes."[1]

The sodium salt of penicillin is a yellow powder readily soluble in water. It is usually furnished in sealed glass ampules containing 100,000 Oxford units. The unit is sometimes called the Florey unit, the terms being synonymous. The unit was assayed by two methods, serial dilution and the plate method.[1]

In its clinical use, no serious toxic effects have been reported. It is synergistic with other drugs, particularly with the sulfa group.

The drug should be stored so that a temperature of approximately 4-10 C. is maintained.

When maintained at this temperature, the solution can be used for approximately three days. At higher temperatures, a fresh solution should be made up daily, with a pyrogen-free physiologic solution of sodium chloride as a solvent. The therapeutic value of penicillin in certain bacterial diseases is now established. With each succeeding month, new organisms are added to the list of those which have proved to be susceptible to penicillin. Most of the gram-postitive cocci and, in addition, the meningococcus, the gonococcus, the an-

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1. Fleming, Alexander: Antibacterial Action of Cultures of Pencillium, with Special Reference to Use in Isolation of B. Influenzae. Brit. J. Exper. Path., 10:226, June 1929.

thrax bacillus, the organism of gas gangrene, *Treponema pallidum*, the organisms of Vincent's angina and some strains of the actinomyces comprise the list.[2]

Mahoney *et al.* showed that, in experimental animals, the spirochete of syphilis was susceptible to intramuscular administration of penicillin, and they were able to obtain a negative dark-field within a few hours after administration of the drug.[3] This has been substantiated by the experiments of Herrell, and the more recent demonstration of the penicillin susceptibility of *Leptospira icterohaemorrhagiae*. A recent report taken from the proceedings of the staff meetings of the Mayo Clinic states that penicillin may be effective in the treatment of rat-bite fever due to infection from either *Spirillum minus or Streptobacillus moniliformis*. These studies showed that mice given injections with either of these organisms survived the disease when they were treated with penicillin.[4]

Hobby, Mayer and Chaffee carried out *in vitro* tests of the activity of penicillin and supplied two lists of organisms, one being called "susceptible strains" and the other "insusceptible strains," as shown in the accompanying table.[5] Considerable variation in the degree of susceptibility was found among different strains of the same organism.

The infections caused by gram-negative bacilli have been found to be penicillin-resistant.

From various studies, it appears that penicillin has a primary inhibitory effect upon the reproduction of susceptible organisms. Multiplication of the organisms is impeded by inhibition of fission. There is bacteriostasis rather than lysis. Thus, its action differs from that of the sulfonamides in that the latter cause only a reduction in the rate of bacterial

ORGANISMS SUSCEPTIBLE AND INSUSCEPTIBLE TO PENICILLIN

Susceptible Strains	Insusceptible Strains
Pneumococcus	H. influenzae
Streptococcus haemolyticus	E. coli
Staphylococcus	B. typhosus
Meningococcus	B. dysenteriae
Gonococcus	B. proteus
Streptococcus viridans	B. paratyphosus A
B. subtilis	B. enteritidis
Cl. welchii	B. pyocyaneus
V. septique	B. fluorescens
Cl. histolyticum	B. prodigiosus
B. sporogenes	Friedlander's bacillus
B. oedematiens	1 strain of Staphylococcus albus
B. sordellii	1 strain of Micrococcus albus
Lactobacillus	Monilia albicans
Cryptococcus hominis	Monilia krusei
	Monilia candida

2. Herrell, W. E.: Clinical Use of Penicillin, Antibacterial Agent of Biologic Origin. J.A.M.A., 124:527, March 4, 1944.

3. Mahoney, J. F.; Arnold, R. C., and Harris, A. D.: Penicillin Treatment of Early Syphilis, Preliminary Report. Ven. Dis. Inform., 24:355, December 1943; Am. J. Pub. Health, 33:1387, December 1943.

4. Heilman, F. R., and Herrell, W. E.: Penicillin in Treatment of Experimental Infection with Spirillum Minus and Streptobacillus Moniliformis (Rat-Bite Fever). Proc. Staff Meet., Mayo Clin., 19:257, May 17, 1944.

5. Hobby, Gladys L.; Mayer, Karl, and Chaffee, Eleanor: Activity of Penicillin in Vitro. Proc. Soc. Exper. Biol. & Med., 50: 277, June 1942.

growth; nor is the action of penicillin impaired by the presence of serum, pus, blood or the products of tissue autolysis.[6]

With the knowledge that a large number of the organisms found in the mouth were in the penicillin-susceptible list, a review of the oral flora is presented.

Thompson and Thompson[7] write:

> It seems to us that the normal flora of the mouth are of no value whatsoever in human economy, except that perhaps their presence on the mucous membrane may prevent the settling down of other dangerous bacteria. They may also serve as a constant stimulus for the production of antibodies. We believe that if the mouth could be kept sterile, our health would be greatly benefited.

The experiments of Stuart, Knudson and Arnold[8] have shown that the cheeks, side of the tongue, frenulum of the tongue and vestibule of the mouth have autosterilizing power and do not become sites of infection until this power is broken down by trauma, contact infection or constitutional disease, and that the dorsum of the tongue, zone of contact of the lips and the gums have no autosterilizing power.

There seems to be little agreement among the various investigators as to the nature of the oral flora, but all seem to agree that the streptococci predominate. Bibby[9] says:

> A great variety of organisms are known to exist in the mouth and practically all known types of bacteria have been isolated from it from time to time. However, the occasional finding of tetanus bacilli and the like in it merely indicates that they are transitory inhabitants and does not establish them as members of the oral flora. Such a position should be reserved for those organisms which are present in detectable numbers in all mouths and which undergo multiplication there. Unfortunately, we have no satisfactory way of identifying these types or of classifying them. Therefore, the most practical way of reviewing the flora is to consider in order the oral micro-organisms falling in the major bacterial groups (cocci, bacilli, etc.).
>
> *Cocci.*—Cocci outnumber all other types of organisms. In more than 90 per cent of actual counts[10] of organisms from different sites in many mouths, they made up more than 50 per cent of the total. Gram-positive and gram-negative cocci are found in varying ratios. Estimates generally indicate an excess of gram-positive forms. Correlated smear and culture studies indicate that streptococci predominate.
>
> No recent study of the oral streptococci has been made. General reviews[11] suggest that most of alpha and nonhemolytic mouth types should be grouped as viridans streptococci. . . . The other major groups of streptococci are not prominent in the mouth. . . .
>
> Of the other gram-positive cocci found in the mouth, anaerobic forms seem to be the most common. . . .
>
> The frequency of occurrence of staphylococci and sarcinae has never been established. Although staphyloid colonies are seen, we have seldom found typical staphylococci except in inocula from about the exposed portions of the mouth. Sarcinae are slightly more common, but never numerous. . . .
>
> Gram-negative cocci are common in the mouth and occasionally are more numerous than the gram-positive forms. . . .
>
> *Bacilli.*—Except for the early work, which is of questionable value, few types of true bacilli, as distinct from the fusiform bacillus or leptotrichia, have been found in the mouth. Direct counts indicate that bacilli represent a higher percentage of the oral flora than cultures indicate. In more than half the smears examined, there was 10 per

6. Abraham, E. P., and Chain, E.: Enzyme from Bacteria Able to Destroy Penicillin. Nature, 146:837, December 28, 1940.

7. Thompson, D., and Thompson, R.: Common Cold. Ann. Pickett-Thompson Lab., 8:57, 1932.

8. Stuart, Carroll W.; Knudson, W. N., and Arnold, Lloyd: J. D. Res., 15:41, February, 1935.

9. Bibby, B. G.: Oral Bacteriology: Basic Considerations Bearing on Disease and Therapy. J.A.D.A., 26:629-636, April 1939.

10. Bibby, B. G.: Thesis, University of Rochester, 1935.

11. Sherman, J. M.: Bact. Rev., 1:3, December 1937.

cent or more of bacilli. Of the cultivated types of gram-positive bacilli, *Lactobacillus acidophilus* has attracted most attention. . . .

Vibrios.—One or 2 per cent of the organisms in most mouths are vibrios, but, in about one-eighth, they make up 5 per cent or more of the total. . . . Increases in the occurrence of vibrios, especially the large type, are sometimes noted in gingivitis and pyorrhea, but such increases also occur in normal mouths.

Fusiform Bacilli.—Fusiform organisms make up more than 10 per cent of the flora in more than 80 per cent of the mouths examined. . . .

Leptotrichia.—To distinguish them from *Leptothrix,* the name *Leptotrichia* is given to the characteristic filamentous bacteria of the mouth. . . . *Leptotrichia buccalis*[10] *is* most commonly found in smears and anaerobic cultures. . . .

Actinomyces.— . . . Cultural studies reveal the presence of from 1 to 3 per cent of tough, adherent, actinomyces-like colonies composed of clubbed and branched bacilli or short filaments. Resemblance to *Actinomyces bovis* is very close. . . .

Spiral Organisms.—The association of the spiral organisms of the mouth *(Treponema)* with disease has attracted a good deal of attention.[12] Although the number of treponemata is vastly increased in certain inflammatory conditions, sometimes to the virtual exclusion of all other organisms, they are not numerous in normal mouths and seldom make up 1 per cent of the flora. . . .

Complex Mouth Organisms.—Organisms of bacterial dimensions, but with a complex structure resembling that of fungi, have been observed.[10] One type, which bears some likeness to the autotrophic *Leptothrix,* has been repeatedly described under the name *Leptothrix racemosa.* . . .

Fungi.—Although cultures on favorable media occasionally show a few yeastlike organisms, these are always very scarce and seldom, if ever, total 1 per cent of the colonies. Smear studies confirm their rarity in the normal mouth. Probably, most of these organisms have been introduced with the food and survive in the mouth only in the presence of food remnants. Monilia are found in pathologic conditions. . . . Myceliaforming organisms are found representing a fairly large number of the local flora.

This review of the oral flora has been made to establish a background for the use of penicillin topically in the treatment of oral infection.

In January 1944, no information was available on the treatment of oral infection by the topical application of penicillin. The lack of information made it imperative that certain studies be made relative to various dilutions to be used, methods of application, frequency of treatment and choice of cases to be treated.

Owing to the apparent lack of toxicity, it was believed that the dilution of penicillin could be determined by trial, without injuring the host tissue or the patient's general health. A dilution of 100 Oxford units per cubic centimeter of physiologic solution of sodium chloride proved to be of insufficient strength, the use of this dilution having no favorable result. An increase in the strength of the solution was made, 500 Oxford units per cubic centimeter being used, and immediately clinical improvement was noted. With the limited amount of penicillin available, it was considered necessary to find the minimum concentration needed for successful therapy. With the dilutions from 100 units to 500 units per cubic centimeter as a basis, it was determined that 250 units per cubic centimeter was the minimum concentration necessary to assure the most satisfactory results. The ideal solution seems to be a dilution of 500 units per cubic centimeter of solvent.

With the factor of dilution decided upon, the next step necessary was determination of the method of application. By trial, it was found that, in topical application, penicillin had to be brought into and maintained in contact with the infected tissue. In order to accomplish this, cotton was placed in a gauze nap-

12. Bibby, B. G., and Van Huysen, Grant: Changes on Enamel Surface, Possible Defense Against Dental Caries. J.A.D.A., 20:828, May 1933.

kin 2 by 6 inches and a roll was formed and tied at each end, and once or twice in between, with dental floss. A number of these rolls were made up and autoclaved. They were then placed between the cheek and the gum tissue and the tongue and the gum tissue. In order to reduce the fluid content of the mouth and prevent further dilution of the penicillin, a saliva ejector was inserted. Pledgets of cotton saturated with penicillin were packed in the interproximal spaces and all periodontal pockets. The gauze napkin and the entire mouth and throat were then sprayed with penicillin, from a standard spray bottle. This method of treatment will use about 5 cc. of solution.

The effective time element of the drug under the mouth conditions when applied topically is unknown. With this fact in mind, it was necessary to try treatments varying in length of time and frequency. There was clinical evidence that satisfactory results were obtained when packs were allowed to remain in the mouth for fifteen minutes, the frequency being determined by the clinical findings.

In cases of oral infection treated topically, namely periodontoclasia, pericoronitis, gingivitis and Vincent's stomatitis, it has been found that a case can be carried to a satisfactory conclusion after one or two packings by spraying the throat and gum tissue with penicillin, using a dilution of 500 units per cubic centimeter, the solution being allowed to remain in the mouth for three or four minutes. The use of a normal saline solution as a mouth wash three times daily between treatments is advised.

Like all drugs used in the treatment of oral infection, penicillin *per se* is not a cure-all. It is merely an adjunct to good dental treatment and care. It must always be borne in mind that the principles of Dentistry cannot be dispensed with or ignored. Since the gum tissues have no power of autosterilization,[8] removal of the calculus is essential, that the drug may come in direct contact with the infected tissue. Irritation from all sources, namely faulty occlusion, faulty margins, poor oral hygiene and ill-fitting prosthetic appliances, must be eliminated. In our early work with penicillin, a number of cases were treated with certain sources of irritation still present, and there was very little clinical improvement. This only emphasizes the fact, as stated above, that penicillin *per se* is not a cure-all.

In cases of Vincent's stomatitis with complications such as extreme swelling of the throat, trismus and a high temperature, a physician should be consulted and the topical application should be augmented by intramuscular injections.

The method of local treatment and the frequency of treatment will, in every case, depend on the clinical findings. We have found that all cases need treatment at least once every twenty-four hours and some as often as three times a day.

Evidence of the presence of penicillin, a fluorescent substance, in the mouth after three and one-half hours has been demonstrated by fluorescent studies under ultraviolet light. Color slides showing penetration and absorption of penicillin under ultraviolet light and slides showing the progress of selected cases were and are now being made.

Reports on twenty-five cases selected at random from our files are attached, with a graph of sixty cases of Vincent's infection treated by us with penicillin and various other drugs indicating the number of treatment days necessary to assure the disappearance of the organisms from the site of infection.

CONCLUSIONS

1. We recognize that the evidence here presented is not sufficient to justify the conclusion that penicillin is useful in the routine treatment of Vincent's infection of the mouth. It is our hope that the appearance of this paper will

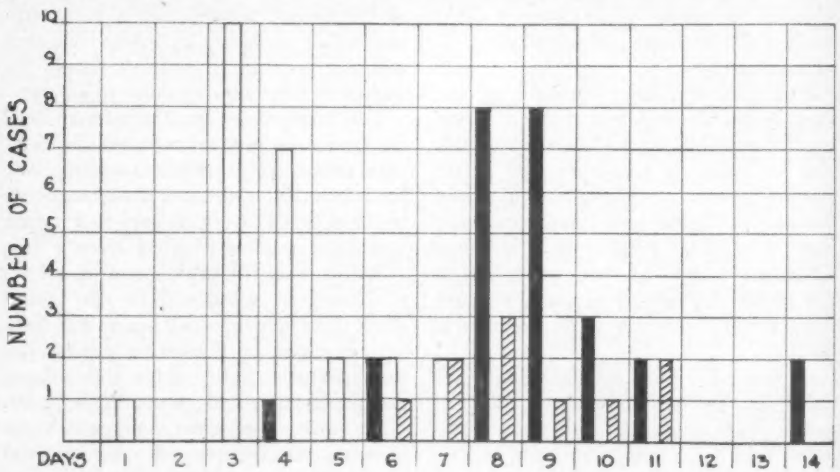
lead to further investigation of the usefulness of penicillin in this connection.

2. Irritating dental defects which predispose to infection must be eliminated before treatment can be effective.

3. Established methods to correct defects predisposing to infection must be rigidly followed.

4. Fluorescent and photographic studies that are now being made, showing penetration and absorption, will, we believe, yield further information that will be helpful in treatment; i.e., the length of time that a known dilution of penicillin will remain in the tissues in sufficient concentration to be effective.

5. There is evidence that, in the case of patients hospitalized for Vincent's infection of the mouth, the number of hospital days may be reduced from one-half to two-thirds of the number now required.



Number of cases of Vincent's infection treated December 1, 1943 to April 10, 1944 and time required to eliminate organisms with various medicaments. The white columns indicate penicillin therapy; green, sulfadiazine, intravenous mapharsen, hydrogen dioxide, etc.; striped, sulfadiazine.

REPORT OF CASES

CASE 1.—A man, aged 23, with a history of malaria, sore throat and bleeding gums, suffered from inflammation and bleeding of the gums, which also showed mucous patches. There was slight swelling of the throat. Caries was 4+, with erosion and heavy calculus. There was slight periodontoclasia. The diagnosis was Vincent's stomatitis (infection), and penicillin was given topically. Smears showing Vincent's organisms became negative after three days. The mucous patches disappeared in fifteen hours and soreness subsided after twenty-seven hours.

CASE 2.—A man, aged 24, with a history of Vincent's stomatitis which had been treated for three years and never completely cleared up, suffered from a slightly sore throat and inflamed and bleeding gums, which also showed mucous patches. Caries was 4+, with heavy calculus, but no periodontoclasia. The diagnosis was Vincent's stomatitis, which was treated topically with penicillin. Smears showed positive Vincent's organisms, which became negative in three days. The soreness subsided in six hours and the gums appeared almost normal in twenty-four hours.

CASE 3.—A man, aged 28, gave a history of swelling about the jaw which made the patient believe he had mumps. The gums were inflamed and bleeding and showed mucous patches. The throat was quite

swollen and slightly sore. Caries was 1, with medium calculus. There was no periodontoclasia. The diagnosis was Vincent's stomatitis, and penicillin was used topically. Smears showing Vincent's organisms became negative in three days. The swelling subsided completely in forty-eight hours.

CASE 4.—A man, aged 40, who had never had periodontoclasia treatments, was suffering from inflamed and bleeding gums. The throat was normal. There was no caries, but calculus was heavy. The diagnosis was periodontoclasia, severe and generalized. The calculus was removed and penicillin was given. No smears were taken and the gum inflammation subsided after one treatment.

CASE 5.—A woman, aged 28, with a history of a bad taste in the mouth and bleeding of the gums when brushed, had inflamed and bleeding gums. The throat was normal. Caries was 1, with medium calculus. There was no periodontoclasia. The diagnosis was severe gingivitis, which was treated topically with penicillin after the removal of the calculus. The smears showed few fusiform bacilli and spirilla. The gums did not bleed after the first treatment and appeared normal after the third treatment.

CASE 6.—A man, aged 26, with a history of bleeding of the gums, which had never been treated before, was suffering from inflamed and bleeding gums. The throat was slightly sore. Caries was 2+, with heavy calculus. Periodontoclasia was slight and generalized. The diagnosis was Vincent's stomatitis, which was treated topically with penicillin. Smears showing Vincent's organisms became negative in five days. Little improvement was found until after the second treatment. The hygienic condition of the mouth was poor.

CASE 7.—A youth, aged 20, had a history of bleeding of the gums on brushing. The gums were inflamed, but the throat was normal. Caries was 1, with medium calculus. There was no periodontoclasia. The diagnosis was gingivitis, moderate and generalized. Penicillin was given topically. Smears were negative for Vincent's infection. The gum inflammation subsided after the first treatment.

CASE 8.—A man, aged 29, gave a history of sore throat and bleeding of the gums. On examination, the gums were inflamed and bleeding. The throat was slightly sore. There was no caries and the calculus was medium. There was no periodontoclasia. The diagnosis was Vincent's stomatitis, and penicillin was given topically. Smears showing Vincent's organisms became negative after seven days. The soreness of the throat disappeared after the first treatment and the bleeding subsided.

CASE 9.—A man, aged 43, who had never had periodontal treatments, had inflammation of the gums, with throat normal. Caries was 4+, with heavy calculus. Periodontoclasia was generalized, but severe. The diagnosis was severe periodontoclasia, which was treated topically with penicillin. The calculus was removed. Inflammation subsided after the first treatment and the gums became normal after the third treatment.

CASE 10.—A man, aged 22, had a history of several recurrences of Vincent's stomatitis over a period of a year. The gums were inflamed and bleeding and mucous patches were evident. The throat was slightly sore. Caries was 2+, with medium calculus. There was no periodontoclasia. The diagnosis was Vincent's stomatitis, which was treated topically with penicillin. The smears showing Vincent's organisms were still positive after four days, but became negative after seven days. The mucous patches disappeared in twenty-four hours and the occlusion was adjusted.

CASE 11.—A man, aged 26, who had never had any gum soreness or bleeding before, on examination showed inflamed gums with bleeding and mucous patches. The throat was slightly sore and there was some swelling. Caries was 4+, with medium calculus. There was no periodontoclasia. The diagnosis was Vincent's stomatitis, which was treated topically with penicillin. Smears showing Vincent's organisms became negative in four days. Mucous patches disappeared in twenty-four hours and the soreness and swelling of the throat and gums subsided in forty-eight hours.

CASE 12.—A man, aged 23, had a history of bleeding of the gums over a period of several years. The gums were inflamed and bleeding and showed mucous patches. The throat was slightly sore. Caries was 1+, with heavy calculus. There was no periodontoclasia. The diagnosis was Vincent's stomatitis, which was treated topically with penicillin. The smears showing Vincent's

organisms became negative in four days. The mucous patches disappeared in twenty-four hours and the soreness subsided in forty-eight hours.

CASE 13.—A man, aged 34, had a history of bleeding of the gums over a period of several years, but had never had any treatment. On examination, the gums were inflamed and bleeding and also showed mucous patches. The throat was slightly sore and slightly inflamed. There was no caries, but calculus was heavy. Periodontoclasia was moderate, but generalized. The diagnosis was Vincent's stomatitis, which was treated topically with penicillin. The smears showing Vincent's organisms became negative in five days. The mucous patches disappeared and the soreness subsided in forty-eight hours.

CASE 14.—A man, aged 22, had a history of bleeding of the gums for several years. The gums were inflamed and bleeding and the throat was normal. Caries was 4+, with heavy calculus. There was no periodontoclasia. The diagnosis was severe gingivitis, which was treated topically with penicillin. The smears were negative for Vincent's infection. The bleeding subsided in twenty-four hours and the inflammation in forty-eight hours. The gums appeared normal in seventy-two hours.

CASE 15.—A man, aged 22, had a history of bleeding of the gums for several years. The hygienic condition of the mouth was poor. The gums were inflamed and bleeding and showed mucous patches. The throat was slightly sore. Caries was 4+ and calculus was heavy. There was no periodontoclasia. The diagnosis was Vincent's stomatitis, which was treated topically with penicillin. The smears showing Vincent's organisms remained positive for four days, but became negative in seven days. The mucous patches disappeared in forty-eight hours.

CASE 16.—A man, aged 22, with a history of frequent sore throat and bleeding gums, suffered from inflamed, bleeding gums, which also showed mucous patches. There was considerable swelling and soreness of the throat. Caries was 2+, with medium calculus. There was no periodontoclasia. The diagnosis was Vincent's stomatitis, which was treated with nicotinic acid and topical applications of penicillin. Smears showing Vincent's organisms became negative in eight days. The mucous patches disappeared in twenty-four hours, although little improvement was actually noted for five days as the patient was not cooperative. Vitamins were prescribed and the occlusion was adjusted.

CASE 17.—A man, aged 25, who had never had any gum soreness or bleeding before, was found to be suffering from inflamed, bleeding gums, which also showed mucous patches. The throat was considerably swollen and sore. Caries was 2+ with heavy calculus. The periodontoclasia was moderate and generalized. The diagnosis was Vincent's stomatitis, which was treated with ascorbic acid and topical applications of penicillin. Smears of Vincent's organisms became negative in three days. The mucous patches disappeared in twenty-four hours and the inflammation and bleeding subsided in twenty-four hours.

CASE 18.—A woman, aged 23, with a history of difficulty with lower third molars for several years, on examination showed inflamed and bleeding gums, with mucous patches. The throat was slightly sore. There was no caries and the calculus was medium. There was no periodontoclasia. The diagnosis was Vincent's stomatitis and pericoronitis of the lower left third molar, which was treated topically with penicillin. The smears of Vincent's organisms became negative in ten days. The patient was not cooperative and smoked incessantly. The mucous patches disappeared in twenty-four hours and the pericoronitis subsided in seventy-two hours.

CASE 19.—A man, aged 29, with a history of bleeding gums for several years, suffered from inflammation and bleeding of the gums, which also showed mucous patches. The throat was slightly sore. Caries was 2+ and calculus heavy. There was no periodontoclasia. The diagnosis was Vincent's stomatitis, which was treated topically with penicillin. The smears of Vincent's organisms became negative in five days. The mucous patches disappeared in twenty-four hours and the soreness and bleeding subsided in forty-eight hours.

CASE 20.—A youth, aged 20, with a history of bleeding of the gums over a period of several years and poor occlusion, suffered from inflamed and bleeding gums, which showed mucous patches. The throat was slightly sore and caries was 1+, with medium calculus. There was no periodonto-

clasia. The diagnosis was Vincent's stomatitis, which was treated topically with penicillin. The smears of Vincent's organisms became negative in five days. The mucous patches disappeared in forty-eight hours. The inflammation subsided and the occlusion was adjusted in seventy-two hours.

CASE 21.—A man, aged 29, who had never had any soreness or bleeding of the gums before, on examination showed inflamed and bleeding gums with mucous patches. Caries was 1 and calculus was heavy. There was no periodontoclasia. The diagnosis was Vincent's stomatitis, which was treated topically with penicillin. The smears of Vincent's organisms became negative in three days. The mucous patches disappeared in twenty-four hours and the inflammation subsided in forty-eight hours.

CASE 22.—A youth, aged 19, who had never had any soreness or bleeding of the gums before, on examination showed inflamed and bleeding gums with mucous patches. The throat was slightly sore and caries was 1+, with heavy calculus. There was no periodontoclasia. The diagnosis was Vincent's stomatitis, which was treated topically with penicillin. The smears of Vincent's organisms became negative in three days. The mucous patches disappeared and inflammation subsided in twenty-four hours.

CASE 23.—A man, aged 26, had a history, extending over a period of three months, of bleeding of the gums on brushing. The gums were found to be inflamed and bleeding and showed mucous patches. The throat was slightly sore and caries was 1, with medium calculus. There was no periodontoclasia. The diagnosis was Vincent's stomatitis, which was treated topically with penicillin. The smears of Vincent's organisms became negative in five days. The mucous patches disappeared in forty-eight hours and the inflammation and soreness subsided in seventy-two hours.

CASE 24.—A man, aged 22, with a history extending over a period of several years, of bleeding of the gums on brushing suffered from inflamed and bleeding gums, which also showed mucous patches. The throat was slightly sore. There was no caries and the calculus was slight. There was no periodontoclasia. The diagnosis was Vincent's stomatitis, which was treated with nicotinic acid and ascorbic acid, with topical applications of penicillin. The smears of Vincent's organisms became negative in five days. The mucous patches disappeared in forty-eight hours and the inflammation and soreness subsided in seventy-two hours.

CASE 25.—A man, aged 33, with a history of recurrent Vincent's infection extending over a period of three years, suffered from inflamed, bleeding gums, which also showed mucous patches. The throat was slightly sore and caries 1+, with heavy calculus. There was no periodontoclasia. The diagnosis was Vincent's stomatitis, which was treated with nicotinic and ascorbic acids and topical applications of penicillin. The smears of Vincent's organisms became negative in four days.

The mucous patches disappeared in twenty-four hours and the inflammation and bleeding subsided in forty-eight hours. The occlusion was adjusted.

THE USE OF PENICILLIN IN CLINICAL DENTISTRY*

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THE purpose of this paper is to present to the dental profession the results that have been obtained in fifty-six cases in the treatment of various dental conditions with penicillin. Herrell *et al.*[1, 2] have reported the successful use of penicillin in six cases of facial cellulitis; Thoma[3] has used it with equal success in a fracture of the mandible complicated by submaxillary and pterygomandibular abscess, while Dawson and Hobby[4] have used it in aplastic anemia with a fulminating Ludwig's angina due to the presence of hemolytic streptococci and the hemolytic *Staphylococcus aureus*. Their case definitely improved after twenty-four hours of penicillin therapy and, in six days, the neck was normal, but the patient continued a downhill course, which was "presumably due to cerebral bleeding associated with the aplastic anemia." At necropsy a few days later, no gross evidence of infection was found in the tissue of the neck. Mowlem[5] has reported the successful use of penicillin in osteomyelitis of the mandible. There are no reports on the more common infections such as pericoronitis and alveoalgia, and other postoperative sequelae.

Penicillin therapy was instituted to reduce to a minimum the time lost during training. Especially was this true for members of combat crews. The penicillin used in this study was released by the Air Surgeon's Office. The cases were referred for study by the Dental Surgeon, AAF Regional Hospital, Davis-Monthan Field, Tucson, Ariz.

With the release of adequate penicillin to the dental profession at the close of the war, a sufficiently increased number of data will be gathered to allow conclusions to be drawn. The present data are merely indicative.

MATERIALS AND METHODS

To obtain as much information as possible with a very limited supply, it was necessary to restrict the use of penicillin to the four general types of cases listed below:

1. Those infections that were resistant to the usual therapy.

2. Pericoronal infections of such severity that the time spent on the usual treatment would prevent the patient from shipping with his combat crew.

3. Root canal treatment for anterior teeth in an attempt to evolve a rapid and completely satisfactory therapy.

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1. Herrell, W. E.; Heilman, Dorothy, and Williams, H. L.: Clinical Use of Penicillin. Proc. Staff Meet., Mayo Clin., 17:609, December 30, 1942.

2. Herrell, W. E.: Further Observations on Clinical Use of Penicillin. Proc. Staff Meet., Mayo Clin., 18:65, March 10, 1943.

3. Thoma, K. H.: Clinic of Dental Department of Massachusetts General Hospital and Department of Oral Surgery, Harvard School of Dental Medicine. Am. J. Orthodontics, 30:158, April 1944.

4. Dawson, M. H., and Hobby, Gladys L.: Clinical Use of Penicillin. J.A.M.A., 124:611, March 4, 1944.

5. Mowlem, Rainsford: Surgery and Penicillin in Mandibular Infections. Brit. M. J., 1:517, April 15, 1944.

4. Alveoalgia (dry socket) and other postoperative infections.

Penicillin is not inactivated by pus[6, 7]; hence, its injection into or adjacent to an infected area permitted the greatest possible concentration of penicillin in this area. It has been shown that with a given number of hemolytic streptococci, the rate of killing increased within limits as the concentration of the penicillin was increased.[8] When this procedure was not feasible, the injections were made into the deltoid muscle. With few exceptions, patients remained on duty status throughout the course of treatment, which generally consisted of three injections daily, spaced at three to four hour intervals. Small amounts (0.2-0.6 cc.) of 2 per cent procaine with epinephrine were injected with the penicillin in all but a few instances. The epinephrine in the procaine solution, by its vasoconstrictor action, possibly prevented rapid circulatory absorption of the penicillin, thus retaining the agent in the infected area for a longer period of time.

Inoculum from the root canals and other infected areas was routinely cultured forty-eight hours on chocolate human blood-agar and rabbit blood-agar plates. Anaerobic cultures were not performed routinely, but the exudates obtained from most of the earlier cases were cultured forty-eight hours anaerobically in 10 cc. of blood-tryptone broth and subcultured as necessary for identification. On the basis of the results thus far obtained, a standardized bacteriologic procedure for aerobic and anaerobic cultures has been formulated and is to be employed in the continuation of these experimental studies, in which I had from Capt. Carl H. McLauthlin (MC) and the laboratory personnel the cooperation necessary to this study.

Root canals were treated under aseptic conditions, isolating the tooth with a rubber dam. To ensure sterility, cultures were taken of the field, the instruments and the materials other than penicillin used.

The individual dosage in each case was arbitrarily chosen, and the total number of the Oxford units administered varied greatly from one case to another and often even from one injection to another. Such variations were a necessity in any attempt to discover the standard minimal dosage and standard procedures for one case type. When the study was begun, minimal dosage was thought to be one of the goals because of the limited amounts of available penicillin. Later information, from other sources,[9, 10] demonstrated the production of penicillin-fast organisms through the use of small doses. To minimize such an occurrence, larger doses of penicillin were given in later cases, and attempts to establish minimal dosage were deferred, to be carried out later when supplies would be more abundant.

CASE STUDIES

1. *Cases of Pericoronitis.*—Owing to the large number of men between the ages of 18 and 23 in the Air Corps, pericoronitis is a not infrequent finding. Conservative treatment for the acute phase of the condition, with its suppuration, marked trismus, cellulitis, palpable lymph nodes and acute general malaise, is so time-consuming that a more rapid

6. Abraham, E. P., and Chain, E.: Enzyme from Bacteria Able to Destroy Penicillin. Nature, 146:837, 1940.

7. Fleming, Alexander: Antiseptics in War-Time Surgery. Pharm. J., 145:162, 172, 1940.

8. Hobby, Gladys; Meyer, Karl, and Chaffee, Eleanor: Observations on Mechanism of Action of Penicillin. Proc. Soc. Exper. Biol. and Med., 50:281, June 1942.

9. Rammelkamp, C. H., and Maxon, T.: Resistance of Staphylococcus Aureus to Action of Penicillin. Proc. Soc. Exper. Biol. & Med., 51:386, December 1942.

10. McKee, C. M., and Houck, C. L.: Induced Resistance to Penicillin of Cultures of Staphylococci, Pneumococci and Streptococci. Proc. Soc. Exper. Biol. & Med., 53:33, May 1943.

therapy was sought to avoid the loss of so much training.

Here are reported the results obtained by the use of penicillin in twenty-four cases of pericoronitis with a more radical procedure. The method of treatment consisted of injecting penicillin either directly into or adjacent to the inflamed area; intramuscularly into the deltoid, ranged from 1,400 to 20,000 Oxford units. Extraction of the involved tooth was performed in many instances prior to complete recovery from the pericoronitis. Such extraction was based on the fact that the penicillin rendered the blood stream free of penicillin-susceptible organisms. Cultures were routinely taken.

TABLE 1.—TREATMENT OF PERICORONITIS

Case	Organisms Found	Penicillin Oxford Units	Methods*			Treatment in Days
2	Nonhemolytic, gram-positive cocci; alpha (viridans) streptococci	9,000	L			2
3	Nonhemolytic, nonpigmented, gram-positive cocci	8,000	L			3
7	Beta hemolytic streptococci	80,000			C	6
10	Oxidase-positive, gram-negative diplococci, apparently N. catarrhalis	22,600	L			5
11	N. catarrhalis	22,800	L			5
12	N. catarrhalis	14,000	L			4
16		100,000			C	2
17		50,000			C	3
20		300,000		I		2
22	Alpha hemolytic streptococci	28,000			C	3
26	Hemolytic staphylococci	60,800			C	3
30		100,000			C	4
32		500,000		I		4
39	Alpha hemolytic streptococci; nonhemolytic Staphylococcus albus; N. catarrhalis	40,000	L			4
40	Alpha hemolytic streptococci; nonhemolytic Staphylococcus albus	120,000			C	2
41	Alpha hemolytic streptococci	110,000			C	2
43		120,000			C	5
44	Alpha hemolytic streptococci	30,000			C	3
45		20,000			C	2
46		20,000	L			2
48	Alpha hemolytic streptococci	80,000			C	4
49	Facultative anaerobic streptococci; hemolytic Staphylococcus aureus; nonhemolytic Staphylococcus albus; N. catarrhalis	30,000	L			3
50	Coccobacillus resembling H. influenzae	150,000			C	3
51	Alpha hemolytic streptococci; N. catarrhalis	70,000			C	3

*L, local; I, intramuscular; C (combination), local and intramuscular.

or into both. The number of Oxford units varied in accordance with (a) the severity of the infection, (b) the clinical response and (c) the route of injection. Intramuscular injections consisted of 20,000 Oxford units given about every four hours; while the local injections

The organisms present in all these cases were found to be penicillin sensitive. In not a single case were there unfavorable postextraction sequelae. The use of both the local and the intramuscular injections seemed more effective than the use of either the former or the latter

route alone. The number of Oxford units injected, varied from 8,000, in Case 3, to 500,000 in Case 32. The length of treatment varied from two to six days, with a mean of 3.3 days. Almost without exception, the men remained on a duty status, losing little or no training time.

Case 7 showed toxic symptoms commonly ascribed to penicillin,[11] an urticaria. This was relatively mild and did not interfere with treatment.

The course of these cases was one of steady improvement, not of dramatic recovery.

TABLE 2.—ROOT CANAL THERAPY

Case	Diagnosis	Penicillin Total Units	Number Visits
6	Acute pulpitis	5,200	3*
9	Gangrenous pulp upper right lateral incisor	32,000	4†
	Granuloma upper right central incisor	10,000	4†
12A	Acute pulpitis	10,000	3*
1	Periapical abscess	29,800	3 (for root canal)*
24	Acute pulpitis	30,000	4*
23	Gangrenous pulp	40,000	4*

*Success. †Failure

CASE 7.—*History.*—A man, aged 22, complained of severe pain at the angle of the right mandible and inability to open his mouth. Four months earlier, he had had a mild pericoronitis with no trismus. The condition cleared up in forty-eight hours with hot saline rinses.

Two days before referral, the pain was mild, gradually increasing in intensity. There had been no treatment.

Examination.—The general appearance was that of an acutely ill person. The patient was unable to open his mouth more than 1 cm. The lymph nodes in the right submaxillary and sublingual regions were palpable, and there was a markedly indurated area posteriorly from the angle of the mandible. There was difficulty in swallowing. Visual examination was not possible because of the trismus. Retracting the cheek revealed an acutely inflamed area about the erupting right third molar. Pressure on the flap yielded a slight amount of serous exudate.

Diagnosis.—A diagnosis of cellulitis, acute, severe and nonsuppurative, and due to pericoronitis, was made and treatment undertaken immediately.

Course.—At 10 a.m., June 12, 1944, 2,000 units of penicillin was injected with 0.2 cc. of procaine into the inflamed area buccally from the molar. This treatment was repeated at 3 p.m., when cultures were taken. Very little improvement was observed.

At 9 a.m., June 13, there was some improvement in the general condition and the cellulitis; none in the inflamed area. Trismus was still present. A creamy exudate was expressed from under the flap. Four thousand units with 0.4 cc. of procaine was injected locally. At 2 p.m. and at 4 p.m., 4,000 units of penicillin was injected into the deltoid.

Sixteen hours later, there was definite improvement. The patient was able to open his mouth more than twice as wide as on the previous day. The cellulitis was decreased, but the lymph nodes were still palpable. The patient had no pain and had slept well. Another 4,000 units of penicillin was injected intramuscularly with 0.2 cc. of procaine followed by 8,000 units by the same route four hours later.

June 15, a marked improvement was observed. The patient could eat with comfort, being able to open his mouth almost normally. There was practically no trismus. Eight thousand units of penicillin was given intramuscularly about every four hours for four doses and, when the patient was seen on June 16, he appeared to be fully recovered. He was given 10,000 units at 8 a.m. and 12:00 m. and 20,000 units at 4 p.m., and preparations for the extraction were made. Extraction, preceded by a final injection of 4,000 units of penicillin, was followed by uneventful recovery.

The total amount of penicillin administered was 80,000 Oxford units.

11. Keefer, Chester S., and others: Penicillin in Treatment of Infections. Report of 500 Cases. J.A.M.A., 122:1217, August 28, 1943.

The final diagnosis was pericoronitis, acute, severe, suppurative.

Laboratory Data.—Two cultures were made June 12, one yielding beta hemolytic streptococci and one a few colonies of nonpigmented nonhemolytic gram-positive cocci. A culture made June 14 showed many colonies of alpha viridans streptococci. A culture made June 16 yielded tetragenous staphylococci and alpha viridans streptococci.

Discussion.—In view of the virulence of the organism, the early recovery was, in my opinion, due to the local use of the drug. The beta hemolytic streptococci disappeared from the cultures after the first local injection.

injecting 20,000 units locally, grinding the distolingual and distobuccal cusps of the upper right second molar, which were lacerating the lower third molar area and were out of occlusion, and applying gentian violet to the ulcerated area.

Two hours later, 2,000 units was given intramuscularly. There was some improvement.

August 28, there was no pain and there was definite improvement as regards the cellulitis and trismus. Three doses of 20,000 units were given intramuscularly at four-hour intervals, with instruction to rinse the mouth as frequently as possible with magnesium sulfate solution.

August 30, the ulcerated area was com-

TABLE 3.—ALVEOALGIA

Case	Organisms Reported	Penicillin Oxford Units	Methods*		Active Treatment in Days
14		68,000		C	4
19		527,000		C	4
27		24,000	L		6
31		60,000		C	2
33		60,000		C	1
36	Alpha hemolytic streptococci	120,000		C	4
34		20,000	L		7
38		45,000	L		3
42	Alpha hemolytic streptocci	70,000		C	2
52		150,000		C	3
56		30,000	L		2

*L, local; I, intramuscular; C, local and intramuscular.

CASE 16.—*History.*—A youth, aged 20, felt soreness and pain in the area of the lower right third molar for three days. On reporting for sick call August 27, 1944, he was referred for teatment.

Examination.—The patient appeared to be acutely ill, having a general malaise with cellulitis of the right side of the face, palpable submaxillary lymph nodes and a mild trismus. An ulcerated and inflamed area, which was bleeding freely, involved the mesiobuccal margin of the lower right second molar and the lacerated flap covering the third molar.

Diagnosis.—The case was diagnosed as pericoronitis, acute, severe and nonsuppurative.

Course.—Treatment at 1 p.m. consisted of

pletely healed. There was no cellulitis, no trismus and no palpable nodes. Extraction of the third molar was followed by uneventful recovery.

The total amount of penicillin given was 100,000 Oxford units.

Discussion.—While recovery in this case cannot be entirely ascribed to the use of penicillin, its rapidity was, I believe, due in large measure to the use of this agent. Had it been necessary to admit him to the hospital or otherwise cause him to lose more flying time, the patient would have been lost to his crew.

2. *Cases of Root Canal Therapy.*—Satisfactory root canal therapy is an exacting procedure, requiring two consecu-

tive negative bacteriologic reports before the pulp canal can be filled. This is too often a time-consuming task. Local penicillin therapy was employed in an effort to reduce the number of visits to the clinic.

Cases must be carefully selected, for even penicillin therapy is no substitute for surgical measures. Granulomata, for example, must be removed surgically either by extraction or by apicoectomy. Upper anterior teeth were chosen for root canal therapy. A sterile technic was employed. A penicillin solution was used to syringe the pulp canal; sealed in the canal as a medicament between visits, and infiltrated about the apex of the tooth. At least two consecutive negative bacteriologic reports were obtained before the canals were filled with sterile guttapercha. Seven teeth in six patients were so treated. Case 9, in which the upper right central and lateral incisors were treated, ended in failure. This result was due to poor selection, since, on apicoectomy, a granuloma was found at the apex of the central incisor.

In Case 1, a large rarefied area involving the upper right central incisor was freed of pus and filled with penicillin. Subsequently, the putrescent material from the pulp canal was found to be bacteriologically negative. Mowlem[8] similarly found pus from osteomyelitic mandibles previously treated with penicillin to be sterile. Had but a single culture been taken, this might have been considered an error, but all seven subsequent cultures were negative also. Therefore, such an error is improbable. Filling the rarefied area with penicillin presented an almost *in vitro* situation, which offers a possible explanation of this surprising result.

CASE 1.—*History.*—A man, aged 23, who complained of swelling and pain of two days' duration in the upper right central incisor and cuspid region, was accepted for treatment May 11, 1944.

Examination.—The physical examination was negative. Oral examination revealed that the upper right lateral incisor had been replaced by a fixed bridge attached by a three-quarter crown to the right cuspid. The area was acutely inflamed, with marked swelling in this region. The right central incisor did not respond to vitality tests. The right cuspid did. X-ray films disclosed a large rarefied area extending from the mesial aspect of the upper right cuspid, which did not appear involved, to the right central incisor.

Diagnosis.—Periapical abscess of the upper right central incisor and residual abscess of the lateral incisor was the diagnosis.

Operation.—May 11, the abscess was incised and a large quantity of grayish yellow pus was evacuated. A drain was inserted.

Course.—At 9:00 a.m., May 13, the drain was removed and a culture taken. Eight

TABLE 4.—POSTOPERATIVE INFECTION

Case	Organisms	Penicillin Oxford Units	Methods*			Active Treatment in Days
8	Beta hemolytic streptococci	10,000	L			4
5	Alpha streptococci; staphylococci undifferentiated	55,500			C	3
21	Alpha hemolytic streptococci; N. catarrhalis	28,000	L			3
29		30,000		I		3
25		55,000			C	3
37		30,000	L			2
47		40,000			C	2
53		30,000	L			4

*L, local; I, intramuscular; C, local and intramuscular.

thousand five hundred units of penicillin, along with 0.5 cc. of procaine, was injected into the abscess cavity through the incision and infiltrated about the upper right central incisor. The swelling was considerably improved and there was no pain. The tissue color was normal. At 1:30 p.m., 7,000 units of penicillin was similarly injected.

Cultures taken daily from May 15 to 23 inclusive were reported sterile.

Root canal therapy on the upper right central incisor was begun on May 22. A black, foul-smelling, gangrenous pulp was removed and cultured. The canal was cleansed with penicillin solution. Cultures were taken. Five thousand units of penicillin was sealed in the pulp canal as the medicament; 3,500 units was injected as

TABLE 5.—CELLULITIS

Case	Penicillin Total Oxford Units	Methods*			Active Treatment in Days
4	12,000	L			1
13	300,000			C	2
5	55,500			C	3
23	65,000			C	3
54	440,000		I		4
55	200,000			C	2

*L, local; I, intramuscular; C, local and intramuscular.

in infiltration anesthesia laterally from the apex of the upper right central incisor.

Treatment on May 23 consisted of taking cultures, syringing the canal with 1,400 units of penicillin and infiltrating 4,600 units of penicillin about the apex of the right central incisor. An attempt was made to inject through the former sinus tract, but this was difficult because the needle was always in tissue. The area was filled with fibrous tissue.

May 29, the canal was syringed with 2,000 units of penicillin and an equal amount was infiltrated about the apex. Cultures were taken, but the laboratory advised that they be disregarded because of contamination in the laboratory.

The total amount of penicillin was 29,500 Oxford units.

The canal was filled June 3.

Laboratory Data.—A culture, May 13, yielded alpha viridans streptococci. Cultures May 15-23 were sterile after seventy-two hours.

CASE 9.—*History.*—A man was referred for treatment with a diagnosis of acute pulpitis of the upper right lateral incisor.

Treatment.—June 24, 1944, the pulp was extirpated and the canal treated with 2,000 units of penicillin after an inoculum was taken. An x-ray film disclosed that the right upper central incisor had a defective root canal filling with apical rarefaction; therefore, the old filling was removed and culture material taken. This canal was similarly treated. In both canals, penicillin was sealed as the medicament. Four thousand units of penicillin was infiltrated about both teeth.

June 28, the canals were reamed and treated as previously. Cultures were taken. Those taken June 24 were all positive.

July 1, the previous procedure was repeated. Cultures of June 28 were positive.

July 3, treatment was again repeated and cultures were again reported positive.

The cultures of July 3 were not sterile. This case was termed a failure. It was decided to perform an apicoectomy. This was subsequently carried out, a granuloma being found at the apex of the upper right central incisor, while necrotic bone was found about the apex of the lateral incisor.

The total penicillin dosage was 32,000 Oxford units.

Laboratory Data. — June 24, cultures yielded gram-negative cocci and diplococci, nonhemolytic and oxidase negative.

June 25, cultures yielded nonhemolytic, nonpigmented gram-positive cocci. Other cultures yielded oxidase negative, gram-negative cocci and diplococci, not morphologically typical of *N. catarrhalis.*

July 1, a culture yielded *Staphylococcus albus.* Another yielded *Staphylococcus tetragenous.* Two cultures yielded *Staphylococcus aureus.*

July 3, a culture yielded alpha streptococci (viridans group.) Two cultures yielded *Micrococcus tetragenous.*

3. Cases of Postoperative Infection.—A. Cases of alveoalgia (dry socket): Postoperative sequelae were diagnosed as alveoalgia if the socket walls were devoid

of a normal blood clot and granulating tissue. Conditions other than alveoalgia were simply diagnosed as "postoperative infections."

The method of administering the penicillin and the dosage were similar to those described for pericoronal cases. In addition, the agent was applied topically to the sockets. In a few cases, this was the only manner of treatment. In the remaining cases, local and intramuscular injections were used in conjunction with such topical application. Penicillin was kept in contact with the socket walls by saturating a drain with it and then packing the drain in the socket. The drain was saturated with penicillin about every three hours, while the drain itself was changed every twenty-four hours for the first two days and then every forty-eight hours. The drains did not have to be saturated with penicillin after the second day.

Eleven cases of alveoalgia were treated with penicillin. Active treatment varied from one to seven days, the mean time being 3.4 days. The number of Oxford units ranged from 20,000 in Case 34 to 527,000 in Case 19. The results of topical application at frequent intervals are encouraging, but the use of local and intramuscular routes in conjunction with topical application seems preferable.

The marked diminution of pain is followed within a short period by active granulation tissue formation. Almost intractable cases such as Case 14 and Case 18 yielded quickly to penicillin therapy.

A toxic reaction consisting of fever and chills was noted in Case 19. After the second day of treatment, these complaints disappeared.

CASE 14.—*History.*—A man, aged 22, referred for treatment on August 5, 1944, complained of severe pain at the angle of the right mandible of sixteen days' duration.

July 20, he had had an impacted right lower third molar removed. He reported extreme pain on July 22. Palliative treatment consisting of the use of a guaiacol drain, eugenol and phenol, packs impregnated with eugenol, silver nitrate and aspirin and a paste of zinc oxide, eugenol and acetyl salicylic acid was tried daily for the next sixteen days, with little success.

Examination of the extraction wound revealed a socket the walls of which were devoid of tissue. The soft tissue about the periphery of the socket was retracted from the socket margins, but was normal in color. There was no pus, but a swab wiping of the socket had a foul odor. The area was extremely tender.

The patient was referred at 10 a.m., August 5 with a diagnosis of alveoalgia (dry socket). The socket was filled with a paste of sterile sulfathiazole and glycerin, while penicillin was being obtained. Four hours later, the socket was cleansed with warm water and then 2,000 units of penicillin was retained in the socket by saturating a pack. Another 2,000 units was injected into the tissue about the socket, while 6,000 units was injected into the deltoid muscle (total 10,000 units). Again in two hours, another 10,000 units was injected intramuscularly. Sedation consisted of administration of one-half grain of codeine plus 10 grains of acetyl salicylic acid every four hours or oftener, if needed.

August 6, the patient had no pain. Examination revealed granulation tissue formation at the base of the socket, the walls of which no longer glistened. The first treatment of the previous day was repeated. Two and four hours later, 2,000 units was injected locally into the socket, and 8,000 units intramuscularly.

August 7, the patient had no pain. There was definite improvement in the condition of the socket. Four thousand units was given locally and 8,000 intramuscularly.

August 8, examination disclosed tissue granulating normally in the socket. There was no pain. Six thousand units of penicillin was given intramuscularly. Active treatment was stopped, but the patient reported every second day so that food débris could be syringed out of the area. August 14, the patient was discharged, relieved.

Discussion.—Treatment did not interfere with his ground or flying training. Here is the textbook picture of a "dry socket" stubbornly resistant to the usual therapy, but

which was very susceptible to penicillin.

CASE 19.—*History.*—A man, aged 22, complained of an intermittently sharp, otherwise dull, pain, with throbbing at times. There was a dull throb "deep down." The lower left first bicuspid was extracted September 8, 1944. The crown was fractured, as were the buccal and lingual plates of the alveolar process, during removal of the root. There was no postoperative swelling, but there was severe pain. Daily postoperative treatment was of no avail.

The patient was referred September 12 for treatment.

Examination.—The lower left first bicuspid area was tender and slightly swollen. The bony walls of the socket were bare. The bone did not have the typical shiny white hard appearance of alveoalgia. There was necrosis at the base of the socket.

Diagnosis.—A diagnosis of atypical alveoalgia was made and the patient was given penicillin.

Treatment and Course.—Three thousand five hundred units was retained in the socket by means of a penicillin-saturated drain.

September 13, there was less pain. Examination revealed no change. The saliva had completely washed the penicillin from the drain. The previous treatment was repeated. Three hours later, the patient complained of inability to eat because of pain. The drain showed slight traces of penicillin. Twenty thousand units of penicillin was injected laterally from the socket. Late that afternoon, the patient was admitted to the hospital. Penicillin therapy intramuscularly was prescribed in the following doses: 40,000 units every four hours for five doses, and thereafter 20,000 units every four hours. Sedation consisted of administration of one-half grain of codeine and 10 grains of acetyl salicylic acid every four hours or as needed.

September 14, there was slight general improvement, with little change in the socket.

September 15, definite improvement could be seen in the appearance of the patient. The walls of the socket were covered by a grayish tissue. The drain was replaced.

Further considerable improvement was noted September 16.

September 17, the patient was discharged, relieved.

The total amount of penicillin that had been administered was 527,000 Oxford units.

Discussion.—This patient seemed not to improve with the use of penicillin locally at widely spaced intervals (twenty-four hours). Although the condition was at first resistant to penicillin, when the patient had received 300,000 units, the response was extraordinarily rapid. Had local application been carried out at two-hour intervals, improvement might have occurred.

CASE 38.—*History.*—A man, aged 27, reported to the dental clinic with a pericoronitis about the right lower third molar October 17, 1944. He was treated daily from this date to October 23 inclusive, with 7 per cent chromic acid followed by hydrogen peroxide and with a mixture of mapharsen and glycerin. The molar was extracted October 23.

The patient returned daily (October 24 to November 2) for postoperative treatment, which consisted of the application of (a) metaphen; (b) guaiacol, and (c) hydrogen peroxide, iodine and guaiacol, with no relief. October 31, a diagnosis of alveoalgia was made, but there was no change in the course of treatment.

Penicillin Therapy.—The administration of penicillin was begun November 3. At this time, the patient was in acute pain. The buccal and lingual plates, now typically those of a dry socket, had been fractured during extraction. A total of 15,000 units was given in three local injections.

The following day there was some improvement. Two injections of 10,000 units each were given locally.

Improvement November 6 was definite and considerable. There was no pain and granulation was occurring. Ten thousand units was injected directly into the socket. Penicillin was discontinued.

The patient was discharged, relieved, November 7.

The total penicillin dosage was 45,000 Oxford units.

Discussion.—Here again is an illustration of an alveoalgia stubbornly resistant to other therapy, but yielding rapidly when penicillin was administered.

B. Cases of "postoperative infection": Under this heading, all postoperative sequelae other than alveoalgia are considered. The treatment and procedures

used were those described for the pericoronitis and alveoalgia cases. Eight patients served as subjects. Active treatment required three days in four cases, two days in two cases and four days in the remaining ones. The mean treatment was three days. The minimum amount of penicillin used was 10,000, the maximum 55,000 Oxford units.

Case 21 is noteworthy as an illustration of the aid of cultures in diagnosing the infection.

Topical application at frequent intervals was quite effective in these cases.

CASE 8.—*History.*—A man, aged 21, first seen June 12, 1944, had appeared at the dental clinic, June 3, complaining of pain in the upper right central incisor, which was extracted. The pain continued. Palliative treatment June 5, 6, 9 and 10 was of no avail.

Examination. — The general examination was essentially negative, but oral examination disclosed a sensitive and acutely inflamed area on the palate lingually from the socket of the upper right central incisor, the walls of which were covered by tissue.

Diagnosis.—The case was diagnosed as a postoperative infection and the patient was given the following treatment:

June 12, 10:00 a.m., cultures were taken and 4,000 units of penicillin was injected buccally and lingually from the socket. At 2:30 p.m., 2,000 units was injected as previously.

June 13-14, 8:00 a.m., the last treatment was repeated.

The total penicillin dosage was 10,000 Oxford units.

Course.—June 13, the inflammation was gone, the tissue appeared normal and the patient felt well.

June 14, the tissue was normal.

June 15, the patient was discharged as recovered.

Laboratory Data.—June 12, a culture yielded beta hemolytic streptococci; another, many colonies of beta hemolytic streptococci.

June 14, a culture yielded many colonies of alpha streptococci.

Discussion.—This case clearly illustrates the efficacy of local injection of penicillin. In this instance, a postoperative infection, caused by a virulent organism which resisted the routine postoperative treatment, responded quickly to local application of a small amount of penicillin. If the intramuscular route had been chosen, 90,000 units would have been the prescribed daily dosage.

It is the opinion that the history and clinical picture of this case did not conform to those commonly associated with alveoalgia. Many other postoperative infections which do not culminate in alveoalgia are possible.

CASE 21.—*History.*—A man, aged 23, referred on September 14, 1944, for treatment, had developed severe pain in the right lower third molar area en route to Lincoln, Nebr., where, August 24, he was treated for pericoronitis with silver nitrate four or five times over a period of seven days. Before treatment was complete, he was transferred to this base, arriving here September 4. The swelling had not yet disappeared. The patient reported at the dental clinic September 7 and was treated for pericoronitis with chromic acid followed by hydrogen peroxide. The molar was extracted September 8. Postoperative care, September 10, 12 and 14, afforded no relief. September 14, the patient was referred to the clinic.

Examination. — The patient appeared acutely ill, suffering from a severe general malaise. There was a swelling of the right side of the face with palpable right submaxillary and sublingual lymph nodes and moderate trismus. It was possible to open the mouth 1.5 cm. Oral examination revealed an ulcerated area covered by a grayish membrane as in Vincent's infection, extending from the mesiobuccal margin of the lower right first molar posteriorly into the socket of the third molar. A similar ulceration involving the lingual wall and the lingual margin of the extraction wound was also present at the margins of the upper molars, extending from the distobuccal margin of the upper right first molar posteriorly to the distobuccal aspect of the upper right third molar. Trismus prevented examination of the throat. A culture was taken on a blood-agar plate and another in tryptone broth for anaerobic organisms.

Diagnosis.—Postoperative infection, acute,

severe, nonsuppurative, of possible Vincent's origin, was diagnosed and the patient was admitted for treatment.

Treatment.—The socket and the ulcerated areas were sprayed every two hours with a solution containing 250 units per cubic centimeter of a physiologic sodium chloride solution. In the intervals between use, the solution was kept in a refrigerator at 5 C.

September 15, there was no improvement in the swelling or nodes, but some in the ulcerated areas and the throat. The socket was filled with 8,000 units of penicillin.

September 16, a fragile epithelium covered the ulcerated area. There was no pain or swelling, but the lymph nodes were slightly palpable.

September 17, the patient returned to duty.

The final diagnosis was postoperative infection, acute, severe, nonsuppurative.

Laboratory Data.—September 14, alpha hemolytic streptococci were obtained in pure culture (blood-agar plate). *N. catarrhalis* was found in pure culture with a few hemolytic streptococci (tryptone broth).

Discussion.—The improvement in the condition between September 15 and 16 was almost dramatic. Laboratory cultures, aerobic and anaerobic, ruled out Vincent's organisms as the etiologic factor in the ulceration. Local applications at frequent intervals proved completely successful.

4. *Cases of Cellulitis.*—Acute cellulitis of dental origin must in the final analysis be surgically treated. Penicillin therapy is not a substitute for surgical measures. It does aid the body in localizing the infection and may permit surgical work early without untoward results. In nonsuppurative cases, it may be successful in causing a rapid subsidence of the swelling and other symptoms.

Six patients were treated, one being given local injection only, while the remaining five were given both local and intramuscular injections. Alleviation of the symptoms required from one to four days, with a mean average of two and one-half days. The total dosage varied from 12,000 units in Case 4 to 440,000 units in Case 13.

CASE 4.—*History.*—A man, aged 28, first seen May 27, 1944, complained of swelling and pain of two days' duration. He came to the clinic May 25, at which time hot applications to the face were prescribed. His face was then so swollen infra-orbitally that he could not see out of the right eye. He did not improve May 26 or 27.

Examination.—The patient was acutely ill, with severe swelling extending infra-orbitally over the right maxilla. The area was tender, not fluctuant, and quite painful. Clinical and roentgenographic examinations of the teeth were negative.

Diagnosis.—The diagnosis was cellulitis, acute, severe, nonsuppurative, of nonspecific origin.

Treatment and Course.—May 27, 6,000 units of penicillin with 0.2 cc. of procaine was injected directly into the swollen area. Treatment was repeated five hours later, at which time the improvement was astonishing.

The cellulitis was not noticeable May 28 and the patient was discharged to duty.

The total penicillin dosage was 12,000 Oxford units.

Discussion.—This is an amazing case. The cellulitis seemed to clear up as if by magic. The only explanation that can be offered is that the organism involved was peculiarly susceptible to penicillin. Injecting the agent directly into the swollen area brought the greatest concentration of penicillin where it was most needed.

CASE 13.—*History.*—A man, aged 21, presented himself for treatment July 26, 1944, complaining of severe pain in the region of the lower right third molar of twenty-four hours' duration.

Examination.—There was a moderate degree of swelling of the right cheek, with inflammation of the tissue about the partially erupted lower right third molar, but no trismus. Pressure on this overlying tissue expressed no pus.

Diagnosis.—A diagnosis of pericoronitis, acute, moderate and nonsuppurative, was made.

Treatment.—Treatment consisted of hot magnesium sulfate rinses given every two hours; extraction of the upper right third molar; application of silver nitrate, gentian violet and merthiolate to the flap, and application of an ice pack to the cheek.

Progress.—July 27, little improvement in the swelling was noted. July 29, the swelling was markedly increased and was accompanied by a throbbing pain.

July 31, the condition was more severe and extremely painful.

August 1, the condition was unchanged and the pain was intensified.

Reexamination.—The patient was admitted to the hospital August 1. He appeared to be acutely ill. There was a tender, soft swelling of the right side of the face. The patient could not open his mouth beyond 0.7 cm., and the right submaxillary lymph gland was the size of a marble.

Treatment.—Penicillin dosage consisted of 40,000 units given intramuscularly every four hours for five doses; then 20,000 units given intramuscularly every four hours for five doses. Liquids were forced and hot compresses applied to the cheek.

Progress in Hospital.—August 2, there was considerable improvement in the cellulitis and trismus.

August 3, penicillin therapy was discontinued. The response of the patient was very rapid. He was able to open his mouth normally and the swelling was hardly remarkable. The submaxillary lymph node was not palpable.

August 4, the patient was discharged, to return to duty.

The total penicillin dosage was 300,000 Oxford units.

The final diagnosis was cellulitis, acute, moderately severe, nonsuppurative, of the right cheek, from pericoronitis.

The impacted lower right third molar was removed August 5. Recovery was uneventful.

Discussion.—This case of cellulitis the source of which was a pericoronitis, when treated with adequate doses of penicillin underwent complete and rapid resolution, permitting surgical treatment.

Had penicillin been given when the patient first presented himself at the dental clinic, with extraction of the upper right third molar, hospitalization might not have been necessary.

COMMENT

The routine of treatment was based on the necessity of having the men miss as little training as possible. In almost all instances, the use of penicillin enabled the men to continue with their training, which consisted of both flying and ground school, thereby permitting them to finish the course of training in the prescribed time and with their assigned crews.

The procaine was very effective in preventing pain during the intramuscular injections. For the local injections, its anesthetic value seemed to vary with the purity of the penicillin solution. With a solution that was straw yellow, its effectiveness was high, but with a penicillin solution that was brown, the procaine seemed less able to prevent pain. Therefore, larger amounts of the anesthetic were used, and with satisfactory results.

There are several features of these cases that are noteworthy. One of these is the routine use of bacteriologic studies. The amount of penicillin to be administered usually depends on the infecting organism. In this small series, it was found that the organisms in question were quite penicillin sensitive. In all but a few cases, the injection of relatively small amounts of penicillin either adjacent to or into the infected area was so effective in clearing up the infection that the patient was either well on the road to recovery or discharged when the bacteriologic report was returned. Nevertheless, the organisms should be cultured, for a great deal of knowledge concerning dosage can be secured from a 24-hour growth. Witness Case 7, in which the beta hemolytic streptococcus was isolated.

The adequacy of the dosage can be determined by the clinical response, both systemically and locally. If desired, blood levels can be determined.

Pericoronal infections are a frequent occurrence in the Army. These conditions must be adequately and completely treated. If this is not done, and the patient's previous history is not taken, postoperative complications may ensue,

as in Case 21. It is to be noted that if the patient is undergoing penicillin therapy, the erupting tooth may be extracted prior to completion of treatment of the pericoronitis. This markedly shortens the recovery period. Penicillin therapy renders the blood stream free of susceptible organisms in a matter of hours, thus preventing a bacteremia after extraction. In this small series, penicillin therapy resulted in rapid recoveries with not a single postoperative complication. The period of treatment varied between two and six days, the mean time being three and three-tenths days. The patients for the most part remained on a duty status, which would not have been possible had penicillin not been given. Penicillin therapy must not be regarded as a substitute for surgical measures, either to obtain drainage or to extract the tooth involved. A combination of local and intramuscular injection was most effective.

Penicillin appears to be a remarkably effective agent in the treatment of alveoalgia or other postoperative sequelae. In the cases of alveoalgia described, both local and intramuscular routes were used. In Case 14, the response was very rapid. In Case 19, local therapy was tried first, with little success; then intramuscular therapy was given, with good results. The postoperative infections responded almost in a matter of hours. Granulation tissue formation in the cases of alveoalgia occurred within forty-eight hours after inauguration of penicillin therapy. It is interesting that the first signs of such improvement are marked alleviation or cessation of pain, and the patient's frequent statement that he "feels 100 per cent better." Owing to the fact that, in healing, a socket affected with alveoalgia granulates at the base first, it was necessary to protect the exposed socket walls. This was accomplished by packing the socket with a drain, which was changed at twenty-four to forty-eight hour intervals. This treatment—termed inactive in this paper—was continued until the bone was covered by tissue.

The use of penicillin in root canal therapy is encouraging. Cases must be carefully selected. Failure in Case 9 was due to poor selection, it being an impossibility to treat a tooth with a granuloma successfully by such measures. Since one sterile culture after another was obtained in the other cases, more work might conclusively demonstrate the adequacy of this agent in root canal therapy. Such fillings should satisfy the medical profession, so that the extraction of teeth thus filled will not be demanded when a focus of infection is sought. Since such a small amount of a medicament can be put in the root canal, it would perhaps be better if the penicillin concentrations used were much higher than in these cases.

SUMMARY

In a group of fifty-six patients with dental infections treated with penicillin, twenty-four patients had pericoronitis, six cellulitis and nineteen postextraction sequelae. Six were given root canal therapy.

Of the patients with pericoronitis, eight were treated locally, two given intramuscular injections only and the remaining fourteen given both local and intramuscular injections. In every case, recovery was rapid. Furthermore, in those cases in which the extraction of the erupting tooth was performed prior to recovery from the pericoronitis, recovery was uneventful.

Penicillin therapy seemed very effective in cellulitis. The infection was checked quickly and recovery was rapid.

Eighteen patients had postoperative sequelae. Of these, eleven were cases of alveoalgia and the others had so-called "postoperative" infections. Penicillin therapy was so effective that active treatment was usually completed by the fourth day. Inactive treatment consist-

ing of the protection of the exposed socket walls by a drain packed in the socket continued until granulation tissue covered the walls. In all cases, the pain disappeared by the second day, when wound repair was underway. The other "postoperative" infections responded equally well.

Five root canals were successfully filled. Treatment of the upper right central incisor and lateral incisor failed in Case 9.

While dosage needs further study, it seems that a combination of local and intramuscular injections affords excellent results. It might be well to begin with one or two local injections of 10,000 Oxford units and then, if desired, change to a combination of local and intramuscular routes. For intramuscular injections, 20,000 Oxford units per dose is recommended.

It was found that the administration of 0.4 cc. of 2 per cent procaine with epinephrine with the penicillin was advisable and quite effective in preventing pain in the intramuscular injections. The amounts of procaine needed in the submucosal injections in the mouth varied with the color of the penicillin solution. The darker the solution, the greater the quantity of procaine needed.

In no instance was penicillin therapy found to be a substitute for surgical measures.

Toxic effects occurred in but two patients. Urticaria, fever and chills were reported.

PENICILLIN IN THE TREATMENT OF VINCENT'S INFECTION*

Carlos F. Schuessler,† B.S., D.D.S.; James M. Fairchild,‡ D.D.S., and Irving M. Stransky,‡ D.D.S.

Vincent's infection has long been a dental problem of confused etiology and uncertain methods of treatment. It is believed by some to be a condition resulting from avitaminosis, with lesions secondarily invaded by bacteria normally present in the mouth. Still others believe the disease to be due to *Treponema vincenti* or to be associated with the *Bacillus fusiformis*. The line of distinction between the normal and the pathologic flora of the mouth is ill defined. There is an equal variety of opinion as to whether the disease is communicable and whether it results from mechanical and chemical irritation. Although it is impossible to resolve the role played by the various organisms in the confusing bacteriologic picture of Vincent's stomatitis, it has seemed possible that penicillin might have an effect on some or all of the organisms concerned.

The effectiveness of penicillin in the treatment of infections due to the presence of gram-positive bacteria and gram-negative diplococci has been amply demonstrated. Mahoney, Arnold and Harris have reported the apparently successful treatment of early syphilis with penicillin.[1] Heilman and Herrell have shown that both *in vitro* and in mice, infections with *Spirocheta obermeieri* can be con-

*A joint report of two independent investigations of the same subject conducted at Lowry Field, Denver, Colo., and Scott Field, Belleville, Ill.

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‡Major (DC).

1. Mahoney, J. F.; Arnold, R. C., and Harris A.: Am. J. Pub. Health, 33:1387, December 1943.

trolled with penicillin.[2] Its use in the treatment of infections associated with *Treponema vincenti* therefore seemed justified.

Independent studies in the treatment of Vincent's stomatitis with penicillin were simultaneously initiated at two Army Air Force hospitals. For purposes of study, patients were selected who had severe ulceromembranous lesions, typical clinically and bacteriologically of Vincent's infection. No patient had had recent previous treatment for this or a similar type of lesion. No supportive treatment or corrective dental care was used in any case until it was free from ulceration and inflammation. For the purposes of study, the patient was considered cured when the mouth was free from ulceration and inflammation and the bacterial picture was characteristic of the normal flora of the mouth. Cases failing to remain free from infection, giving evidence of reinfection, relapse or recurrence during a ten-day period of observation, were termed failures. All patients had been in military service for periods varying from two months to five and one-half years. They were predominantly white and ranged in age from 18 to 37. With few exceptions, they smoked cigarets.

METHOD OF TREATMENT

Initially, small groups of patients were hospitalized and, under close observation, were treated by various methods. One group received 25,000 units of penicillin intramuscularly at three-hour intervals, either five or eight times daily. Individuals received a total of from 500,000 to 835,000 units of penicillin.

The second group was treated with topical applications of penicillin. Part of the group received a concentrated solution of penicillin applied locally and the others received penicillin in lycopodium powder. The solution was prepared by dissolving 100,000 units of penicillin in 1 cc. of sterile distilled water. The lesion was carefully dried by air; the equivalent of 20,000 units was applied three times daily, and the solution was held in the mouth for two minutes following treatment. The penicillin powder was prepared by mixing 150,000 units of penicillin with 2 gm. of lycopodium powder and the mixture applied to the lesions with an atomizer five times daily at three-hour intervals.

The third group of patients was treated with sprays of a dilute solution of penicillin, made by dissolving 75,000 units of penicillin in 240 cc. of sterile water. The total dosage of penicillin per treatment by this method was not measured, but the spray was used from three to five times daily. In all cases, treatment was continued until the bacterial flora of the mouth were normal on two successive days. Cases were rechecked at intervals of from one to three days for a period of from ten days to two weeks.

TABLE 1.—PENICILLIN TREATMENT OF VINCENT'S INFECTION—HOSPITALIZED PATIENTS

Treatment	Number of Patients	Time Treated Days	Total Dosage	Failures Per Cent
Intramuscular	11	3.70	600,000	27
Topical				
Concentrated solution	5	2.25	150,000	40
Powder	3	3.00	?	0
Mouth sprays	11	4.10	?	18

2. Heilman, F. R., and Herrell, W. E.: Proc. Staff Meet., Mayo Clinic, 18:457, December 1, 1943.

The results of the various methods of treatment are shown in Table 1.

The groups are too small to be of significance in themselves, but, on the basis of this experience, it was decided to try a larger series, using ambulatory patients. One group was treated with a mouth wash of an aqueous solution of penicillin consisting of 100,000 units dissolved in 240 cc. of sterile distilled water. The patients were instructed to take one mouthful of this solution every two hours and hold it in the mouth for five minutes. They were observed daily and given a freshly prepared solution of the drug. Although the patients had no facilities for the refrigeration of the medicament and daily temperatures exceeded 90 F. in some instances, the efficacy of the solution had apparently not been at all affected by the high temperatures.

The other group was treated with a combination of the topical application of a concentrated solution of penicillin, as previously described, plus a spray of 3 cc. of penicillin solution, each cubic centimeter containing 300 units. This was held in the mouth for two minutes after spraying and the mouth was not rinsed. After apparent cure, both groups were observed at three-day intervals for ten days.

Four groups of controls were used. These were alternate cases in the instance of one hospital and, in the other study, were cases of Vincent's infection meeting the diagnostic criteria and reported for treatment during a brief period following the completion of the penicillin treatment study. One control group was

TABLE 2.—PENICILLIN TREATMENT OF VINCENT'S INFECTION—AMBULATORY PATIENTS

Method of Treatment	Penicillin		Controls			
	Mouth-Wash	Topical and Spray	Hydrogen Peroxide Wash	Neo-Glycerin Wash	Chromic Acid	Chromic Acid and Nicotinic Acid
Number of patients	47	32	7	5	18	18
Duration of treatment—days (average)	3.4	2	7	4.2	9	9
Total dosage penicillin	170,000	117,000	—	—	—	—
Percentage of failures	4.3	3.1	*	*	11	27.7

Treatment	Number of Patients	Time Treated Days (Average)	Total Dosage	Failures Per Cent
Penicillin				
Mouth wash	47	3.4	170,000	4.3
Topical and spray	32	2.0	117,000	3.1
Controls				
Hydrogen peroxide wash	7	7.0		*
Neoglycerin wash	5	4.2		*
Chromic acid	18	9.0		11.0
Chromic acid and nicotinic acid	18	9.0		27.7

*Cures not obtained. Further treatment with penicillin mouthwash cleared up the lesions in forty-eight hours plus in all cases.

given a solution of hydrogen peroxide to be used exactly as the penicillin. Another group used a mouth wash made by the solution of 0.9 gm. of neoarsphenamine in 4 ounces of glycerin. (A few cubic centimeters of distilled water was required to dissolve the neoarsphenamine before adding the glycerin.) The solution was used as the penicillin mouth wash. In a third control group, a weak solution of tincture of green soap in water was used as a mouth spray, followed by a 5 per cent chromic acid solution applied topically and neutralized with 3 per cent hydrogen peroxide by spray. One treatment was given every other day, alternating with the topical application of dilute Talbot's solution followed by hydrogen peroxide. Patients were instructed to employ a mercuric chloride-hydrogen peroxide mouth wash three times daily and to limit the use of tobacco and alcohol. The fourth control group received the treatment immediately preceding with the addition of one-half ounce of fresh lemon juice daily and 300 mg. of nicotinamide the first day and 100 mg. daily thereafter for the duration of the treatment.

RESULTS OF TREATMENT

Forty-seven patients were treated with a penicillin mouth wash for an average of 3.4 days, receiving an average of 170,000 units of penicillin. There were 4.3 per cent failures. (Table 2.) Of thirty-two cases treated by topical application and spray for an average of two days, using slightly less than 120,000 units of penicillin, 3.1 per cent were failures. In the control group, patients using the hydrogen peroxide mouth wash and neoarsphenamine glycerin mouth wash failed to respond to an average treatment of seven and four days respectively. When further treatment with the penicillin mouth wash was instituted, the lesions cleared up within forty-eight hours in all cases. Of thirty-six cases treated with chromic acid for an average of eight and a half days, seven were classed as failures.

COMMENT

The advantages in the use of penicillin for the treatment of Vincent's infections are obvious. It is a drug of low toxicity, easily used without hospitalizing the patient, and an apparently satisfactory result is evident in considerably less time than with the other methods of treatment tried. Penicillin affords a further advantage of rapidly clearing up the inflammation and making possible supplementary measures designed to eradicate conditions believed to contribute to the primary infection. The local application of penicillin, either as a mouth wash or by topical application and spray, is preferable to treatment with penicillin given intramuscularly, for it eliminates the inconvenience and discomfort of injections and does not require hospitalization of the patient, and the use of smaller amounts of penicillin apparently has equally satisfactory results. The value of penicillin administered intramuscularly in treating Vincent's infection associated with compound fracture of the mandible and facial bones should not be overlooked. The use of supplementary treatment methods is apparently unnecessary to insure the clearing up of infections, but corrective dental care, including calculus removal and prophylaxes, should be instituted at the earliest possible date after treatment, to insure a permanent result.

CONCLUSIONS

1. A small series of persons with Vincent's infection treated locally with an aqueous solution of penicillin, appeared to respond more favorably than a similar group treated by other methods.

2. Penicillin is apparently an effective agent against Vincent's infection, but additional investigation is needed to determine the best method of application.

EXPOSED PULPS OF TEETH AS THE PORTAL OF ENTRY FOR POLIOMYELITIS VIRUS*

Myron S. Aisenberg, D.D.S., and Thomas C. Grubb, Ph.D., Baltimore, Md.

The portal of entry of the poliomyelitis virus in human beings has received intensive study during recent years because a knowledge of it is fundamental to prevention or control of the disease. For several years, it was generally believed that the only portal of entry was the respiratory tract *via* the olfactory nerves. More recently, the finding of the virus in stools and sewage pointed to the alimentary portal of entry. The present status of the problem is succinctly stated in the recent work of Howe and Bodian,[1] who concluded that "it seems quite definite that while the olfactory bulbs are susceptible to the virus, the olfactory portal is not the usual one," and, further, "as regards the gastrointestinal tract as the portal of entry, the evidence is not so clear as could be desired." We must admit, therefore, that at the present time, the portal or portals of entry of the virus have not been unequivocally demonstrated. The purpose of the present report is to indicate that there is another possible portal of entry, which has thus far not been considered by investigators in this field. In a preliminary publication,[2] we showed that if the poliomyelitis virus is inoculated in exposed pulps of teeth of a *M. rhesus* monkey, paralytic poliomyelitis can be produced. The present report covers the experiments previously published, together with additional experiments and the results of a field survey made by one of us (M.S.A.) of the teeth of children with and without poliomyelitis during the epidemic of 1944.

EXPERIMENTAL

In 1942, Faber and Silverberg[3] reported the finding of histologic evidence of the poliomyelitis virus in the semilunar (gasserian) ganglia of experimentally infected monkeys. This suggested to the senior author that the virus could enter the pulp chamber of a carious tooth with pulpal exposure and travel via the maxillary and mandibular branches of the fifth nerve to the semilunar ganglia. To test this hypothesis, the pulp chambers of the anterior teeth (because they are more accessible than the posterior teeth) of five *M. rhesus* monkeys under pentobarbital sodium anesthesia were exposed by grinding off the enamel on the lingual surfaces and were opened with a No. 6 bur. In some cases, the pulps were removed with a barbed broach. In others, they were undisturbed, as indicated in the description of the individual experiments below. In one monkey, the teeth were extracted and the virus inoculated in the sockets, since our field studies suggested that this might be a portal of entry.

After the blood in the pulp chambers had coagulated, one or more drops of a 20 to 60 per cent suspension of the Creach strain of the virus was placed in the cavity, with extreme care to avoid getting any of the virus outside the

*From the Departments of Oral Pathology and Bacteriology, Baltimore College of Dental Surgery, Dental School, University of Maryland.

1. Howe, A. H., and Bodian, D.: Neural Mechanisms in Poliomyelitis. New York: Commonwealth Fund, 1942.

2. Aisenberg, M. S., and Grubb, T. C.: J. Bact., 46:311, September 1943

3. Faber, H. K., and Silverberg, R. J.: Science, 96:473, November 20, 1942.

Fig. 1.—Dental pulp of upper first molar from a 7-year-old child. *A*, two nerve trunks, *B*, dense plexus of nerves.

pulp cavity. (Francis B. Gordon furnished for this work a virus representing a mixture of the seventh to tenth passages in monkeys.) After an interval of one to five minutes, to allow for physical absorption of the virus, the cavity was sealed with plicene, a tarlike substance of unknown composition obtained

from the Central Scientific Co. During the preliminary experiments, the cavities were sealed with the regular dental silver amalgam, but since none of the animals in which this material was used developed paralytic poliomyelitis, it was suspected that the silver might have an oligodynamic effect on the virus. In the experiments reported here, all cavities were filled with plicene, which did not exhibit any bacteriostatic effect on *Staphylococcus aureus or Escherichia coli*. Great care was exercised to avoid "squeezing" out any of the virus when the fillings were placed in the cavity. In this way, the virus was confined to the pulp, and other possible portals of entry were eliminated. The animals were observed daily for several weeks to detect any signs of paralysis. When paralysis did not occur, the animals were either reinoculated or killed for histologic study of the nervous system.

The virus was prepared by grinding the infected cords with alundum for several minutes and centrifuging lightly. The supernatant fluid was placed in a tuberculin syringe with a No. 22 needle, which permitted placing a small drop of the fluid in the pulp cavity and determination of the total quantity used in each inoculation. In the early experiments, a 20 per cent cord suspension in a saline solution was used, but when this failed to produce paralysis, concentrations of 40 and 60 per cent were employed. Before each cord was used for pulpal inoculations, the activity of the virus was ascertained by the production of paralysis with an intracerebral inoculation in additional monkeys.

Fig. 2.—Roentgenogram of jaw of monkey No. 4. Arrows indicate access to the pulp chambers.

INOCULATION OF ANIMALS

Monkey 4.—The pulps of teeth $\frac{321 \mid 123}{3 \mid 3}$ were exposed and inoculated with a total of 0.5 cc. of a 20 per cent suspension of virus (twelfth passage). The animal showed no signs of paralysis during the following twenty-five days. On the twenty-sixth day, the plicene fillings were removed and the pulps inoculated with a total of 0.5 cc. of a 40 per cent virus (twelfth passage) suspension.

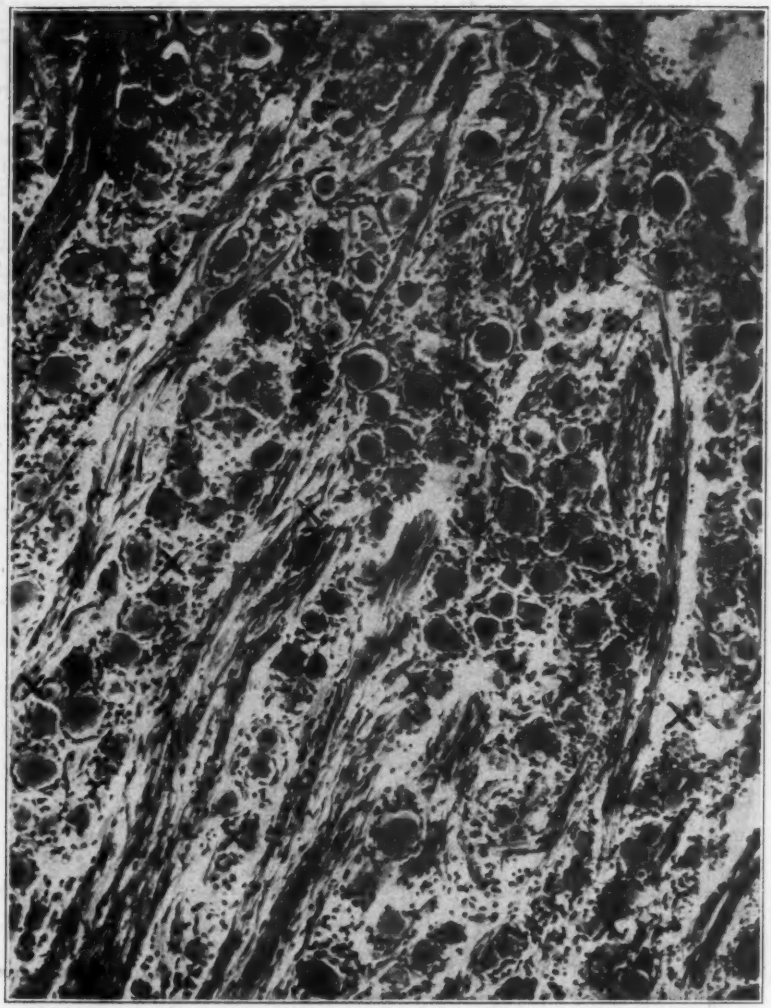

Fig. 3.—Right semilunar ganglion, monkey No. 4. *X*, involved ganglion cells.

Six days after this inoculation, the animal exhibited tremors and muscular weakness. On the following day, the arms and legs were completely paralyzed. On the eighth day, the animal was killed and the brain, cord and semilunar ganglia were removed for sectioning.

Figures 3, 4, 5 and 6 show the histologic sections of these tissues.

Monkey 5.—The pulps of teeth $\frac{21 \mid 12}{}$ were exposed and removed. A total of 0.35 cc. of a 40 per cent suspension of virus was inoculated (thirteenth passage). After twenty-six days, the animal showed no signs of paralysis. On the twenty-seventh day, the pulps of teeth $\frac{21 \mid 12}{21 \mid 12}$ were exposed and a total of 0.35 cc. of a 40 per cent virus (thir-

teenth passage) was inoculated. The animal exhibited no signs of paralysis during the following thirty days. On the thirty-first day, the same eight pulps were exposed and inoculated with a total of 0.5 cc. of 40 per cent virus (thirteenth passage). When the animal showed no paralysis after twenty-eight days, the above-mentioned eight cavities were again opened and the pulps of additional teeth $\frac{3 \mid 3}{3 \mid 3}$ were exposed. A total of 0.4 cc. of 40 per cent virus (fifteenth passage) was used to inoculate all the pulps. Seven days after this last inoculation, the animal gave no evidence of infection and it was killed to obtain sections of the brain, cord and semilunar ganglia.

Monkey 6.—The pulps of teeth $\frac{21 \mid 12}{}$ were exposed and allowed to remain unsealed for the following six days until the pulps had become putrescent (to simulate the usual conditions of pulpal exposure in human beings). The pulps were then inoculated with a total of 0.35 cc. of 40 per cent virus (fifteenth passage) and, at the same time, the pulps of teeth $\frac{3 \mid 3}{3 \mid 3}$ were exposed and left unsealed. After thirty-six days, the animal refused to chew or bite food, but would swallow bread soaked in water. On the seventeenth day, the animal was killed and tissues were removed for section.

Monkey 7.—The pulps of teeth $\frac{21 \mid 12}{}$ were exposed and inoculated with a total of 0.3 cc. of 40 per cent virus (thirteenth passage). About sixteen days after inoculation, the animal refused to chew or bite food, but would swallow bread soaked in water. On the seventeenth day, the animal was killed and tissues were removed for section.

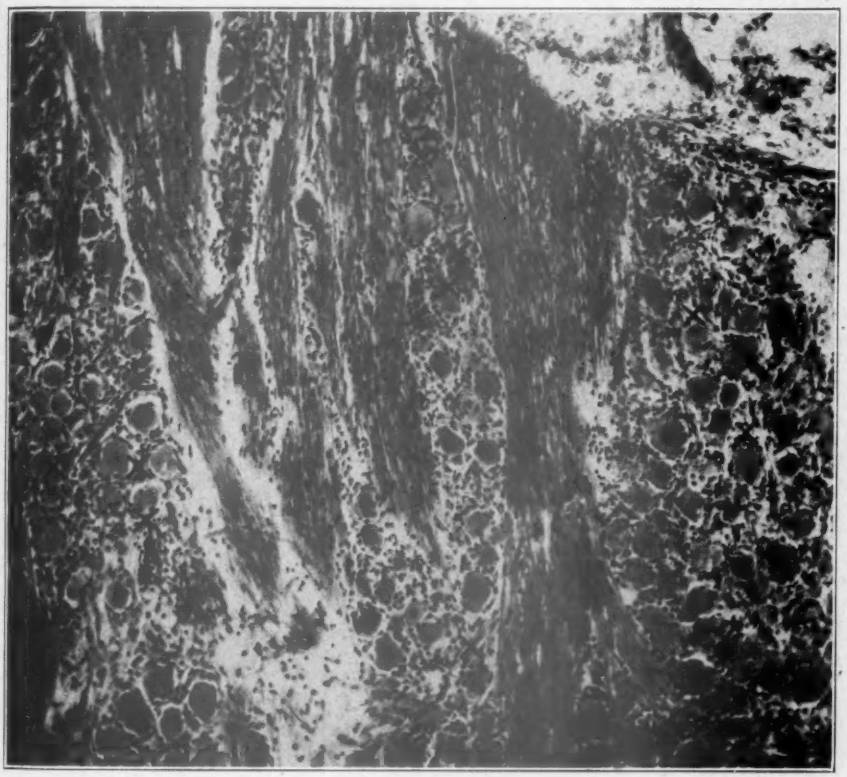

Fig. 4.—Left semilunar ganglion, monkey No. 4. *X*, involved ganglion cells.

days, there was no evidence of paralysis and, on the thirty-seventh day, the pulps of teeth 21 | 12 were reopened and 0.4 cc. of 40 per cent virus (fifteenth passage) were inoculated and the teeth sealed. During the twenty-two days following, there were no signs of infection, and the pulps of teeth 321 | 123 were again inoculated with a total of 0.4 cc. of 60 per cent virus (fifteenth passage). Since there was no evidence of paralysis after seven days, all pulps were reinoculated with 0.4 cc. of 60 per cent virus (fifteenth passage). The animal did not become paralyzed during the following forty-two days. After each inoculation, it refused to eat for a day, but would swallow bread soaked in water. About three to five days after each inoculation, it began to eat fruit and vegetables as usual, but avoided chewing with the anterior teeth. On the forty-third day following the last inoculation, the monkey was killed and the necessary tissues were obtained for section.

Monkey 10.—The pulps of teeth 21 | 12 were exposed and inoculated with a total of 0.1 cc. of 60 per cent virus (fifteenth passage). When the animal did not show any signs of paralysis after twenty days, the pulps were reopened and inoculated with a total of 0.5 cc. of 60 per cent virus (sixteenth passage). After forty-one days, the animal was not paralyzed and, on the forty-second day, teeth 521 | 125 were extracted. After the blood had clotted (ten minutes), each socket was carefully inoculated with 1 drop of 40 per cent virus (sixteenth passage) injected with a No. 22 needle into the clot, using a total of 0.2 cc. of the virus. No paralysis occurred after twenty-seven days and, on the twenty-eighth day, the following additional teeth were extracted:

643	346
654321	123456

and the clots were inoculated as described above. No paralysis occurred during the following fourteen days. The animal was then killed in order to obtain sections of the

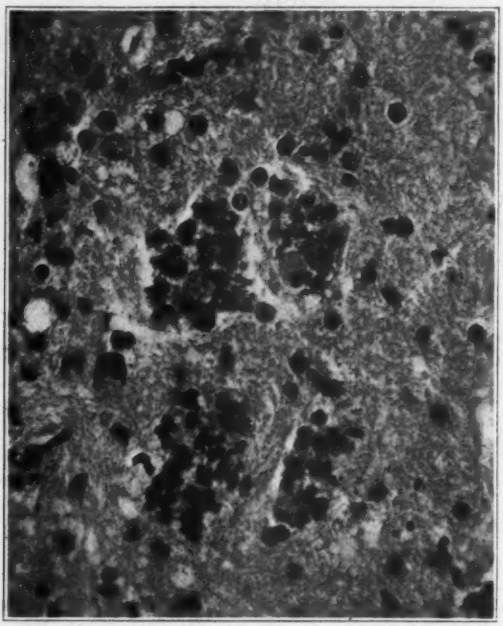

Fig. 5.—Neuronophagia of four motor neurons in cervical swelling of cord in monkey No. 4.

brain, the cord and the semilunar ganglia.

Of the five animals inoculated as described above, only one (No. 4) showed unmistakable signs of flaccid paralysis in the arms and legs. Sections of the cord and semilunar ganglia of this monkey, stained with hematoxylin and eosin (Figs. 3, 4, 5 and 6) showed the typical pathologic picture of poliomyelitis including perivascular infiltration, neuronophagia and karyolysis of many of the ganglion cells and motor neurons. The other four animals, while not developing paralysis, gave definite pathologic evidence of infection in the spinal cords (Figs. 7, 8, 9, 10, 11 and 12). Further discussion of this histopathologic evidence is presented in a later section.

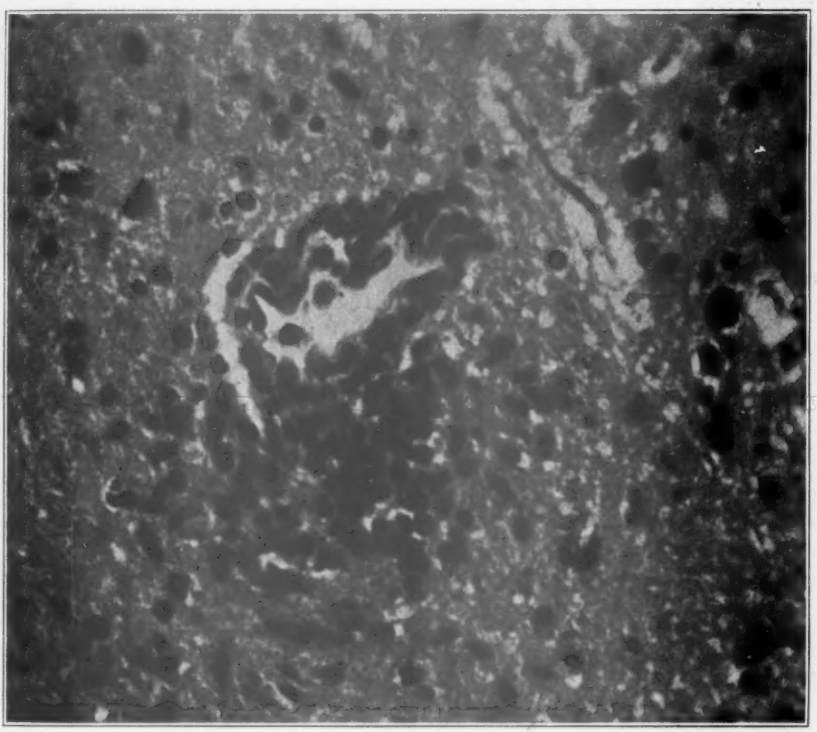

Fig. 6.—Perivascular "cuffing" in gray matter of cord in monkey No. 4.

It is regretted that a sufficient number of animals were not available to determine whether neutralizing antibodies were produced in the nonparalytic cases. The failure to induce paralysis in most of the monkeys may be attributed to a number of facts. The virus may have been of low virulence. The animals may have been comparatively resistant. The amount of virus inoculated may have been too small to produce paralysis. While we employed inocula of 0.3 to 0.5 cc. of a 20 to 60 per cent suspension, which is roughly comparable to 2 cc. of a 20 per cent suspension, used by many workers for intracerebral inoculation, a valid comparison is not possible because the potency of the virus

employed in these experiments was not determined, and many other investigators have not included similar data in their reports.

The one case in which the sockets of extracted teeth were inoculated cannot be taken as evidence that the virus may enter by this route, for, although the cord showed the pathologic changes of poliomyelitis, these might well have been produced by the first inoculations in the exposed pulp chambers. The object in inoculating the sockets after pulpal inoculation had failed to induce paralysis was to determine whether it was still possible to produce the paralytic disease. When other animals are available, it is the intention to inoculate only the sockets of extracted teeth.

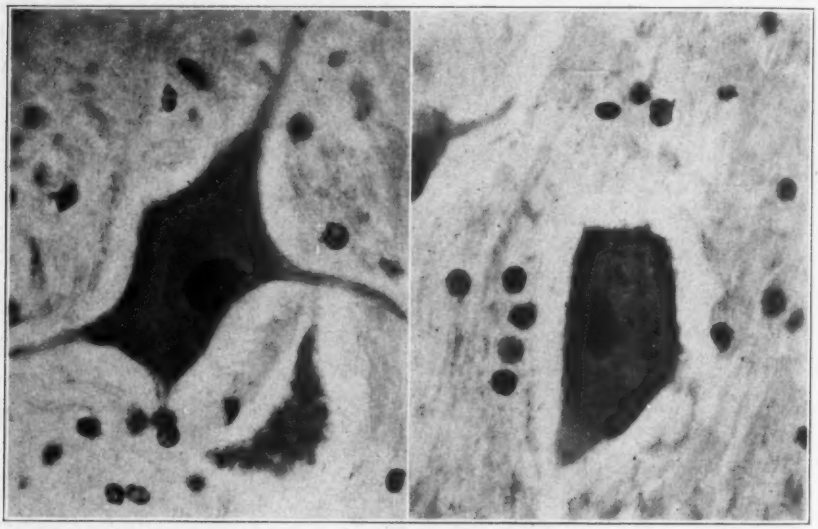

Fig. 7.—Anterior horn cells from area of cervical swelling in monkey No. 5, showing marginations of Nissl's bodies, initial stages of extrusion of pyknotic nuclei.

HISTOPATHOLOGIC STUDIES

Since the dental pulp is richly supplied with nerves arising from the fifth cranial nerve, it is reasonable to believe that a neurotropic virus could easily travel from the exposed dental pulp to the fifth nerve and thence to the brain and spinal cord. To illustrate this portal of entry for a virus, Figure 1 shows the pulp of an upper first molar from a 7-year-old child. Two large nerve trunks are shown at *A*. A dense plexus of nerve fibers, just under the odontoblastic layer, can be seen at *B*, Figure 1. It is evident that exposure of this plexus, due to caries, presents an excellent means for viruses or other neurotropic substances to enter the central nervous system.

In the diagnosis of poliomyelitis, in both the human being and the susceptible animal, considerable reliance can be placed on the characteristic histopathologic changes in the nervous tissue, for there is no other disease that produces similar changes. For this reason, it is generally conceded that, when these changes are found, in the absence of other criteria for the diagnosis of poliomyelitis, it may be concluded that the

animal or human being has been infected with the poliomyelitis virus. It has been repeatedly observed that these changes can usually be found in experimentally infected animals that exhibit no external signs of infection. In such cases, it is concluded that these animals experienced a nonparalytic poliomyelitis infection. In the preceding section, it was noted that but one of the monkeys developed paralysis; hence, it is necessary to rely on the pathologic picture found in the cord and semilunar ganglia of the nonparalyzed animals to prove that a poliomyelitis infection was produced. The results of this study in both the paralyzed and the nonparalyzed animals are as follows:

Paralytic Case (Monkey 4).—Figure 2 is a roentgenogram of the maxillae with arrows indicating the six anterior teeth and showing the manner of access to the pulp chambers. Figures 3 and 4 show the right and left semilunar ganglia, respectively, with the characteristic pathologic changes of poliomyelitis, including lymphocytic infiltration, karyolysis and neuronophagia. In Figure 5, a low-power photograph shows the neuronophagia in four motor neurons in the cervical swelling of the spinal cord. Perivascular cuffing of a capillary in the gray matter at the same level of the cord is evident in Figure 6.

Nonparalytic Cases (Monkeys 5, 6, 7 and 10).—The photomicrographs included here which were selected from several of the animals, are representative of the pathologic changes found in each animal. Figure 7, the anterior horn cells from the area of cervical swelling of monkey 5, shows the margination of Nissl's substance with the initial stages in the extrusion of pyknotic nuclei. A pyknotic nucleus and margination of

Fig. 8.—Pyknotic nucleus and margination of Nissl's bodies from area of cervical swelling in monkey No. 6.

Fig. 9.—Margination of Nissl's bodies and karyolysis of anterior horn cell from area of cervical swelling of cord in monkey No. 7.

Nissl's bodies in the area of cervical swelling of monkey 6 are shown in Figure 8. In a motor neuron from the area of cervical swelling of monkey 7, the margination of Nissl's bodies and karyloysis are seen, in Figure 9. In the same animal, another anterior horn cell showing chromatolysis and intranuclear inclusions may be observed in Figure 10. In Figure 11, a motor neuron from the lumbar swelling of monkey 10 shows complete disappearance of the nucleus as well as margination of Nissl's bodies.

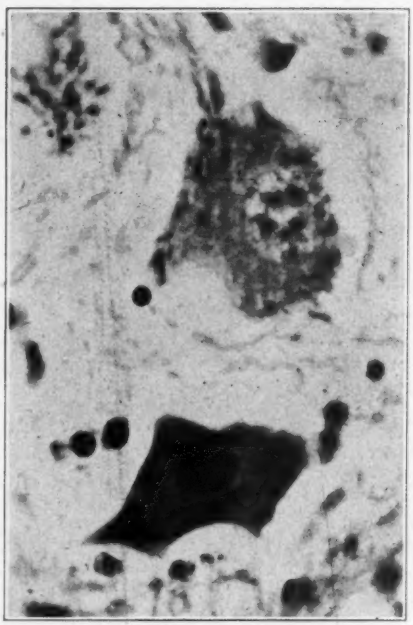

Fig. 10.—Chromatolysis and intranuclear inclusions in motor neuron from area of cervical swelling of cord in monkey No. 7.

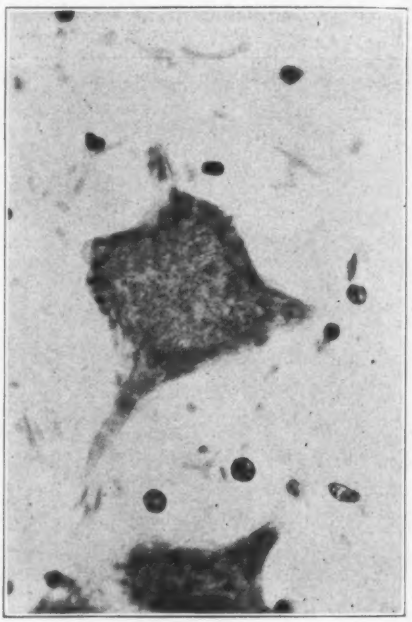

Fig. 11.—Margination of Nissl's bodies and complete disappearance of nucleus of motor neuron from lumbar swelling of cord of monkey No. 10.

It is believed that the histopathologic changes in the nonparalytic animals described above are typical of those seen in experimental poliomyelitis as described by Sabin and Ward[4] and others. Therefore, the conclusion seems justified that poliomyelitis was produced in these animals by the inoculation of pulp chambers.

4. Sabin, A. B., and Ward, R.: J. Exper. Med., 73:757, June 1941.

FIELD STUDIES

Since the preceding experiments had demonstrated that it was possible to produce both paralytic and nonparalytic poliomyelitis in animals, it was thought to be of considerable interest to determine the incidence of pulpal exposure in individuals with and without poliomyelitis. Opportunity for such a study presented itself during the summer of 1944, when an epidemic of considerable extent occurred in various parts of the country. A great number of cases appeared in a small area in the western part of North Carolina. Through the

aid of the Maryland Section of the National Foundation for Infantile Paralysis, it was possible for one of us (M.S.A.) to examine the teeth in 272 cases being treated at the Charlotte Memorial Hospital, the Gastonia Orthopedic Hospital and the Emergency Poliomyelitis Hospital at Hickory, N. C. The teeth of each young adults at Fuquay Springs County School, Fuquay Springs, N. C., and at the Methodist Home of Raleigh, N. C., were examined. As far as was practicable, an effort was made to examine a similar number of children in the same age groups with and without poliomyelitis. (Table 1.)

TABLE 1.—AGE DISTRIBUTION AND INCIDENCE OF PULPAL EXPOSURE IN PERSONS WITH AND WITHOUT POLIOMYELITIS, IN NORTH CAROLINA

Poliomyelitis Cases				Nonpoliomyelitis Cases			
Age	No. of Cases	No. Cases with Exposed Pulps	No. Cases with Pulps Not Exposed	Age	No. of Cases	No. Cases with Exposed Pulps	No. Cases with Pulps Not Exposed
3	2	1	1	3	5	1	4
4	26	16	10	4	11		11
5	27	24	3	5	17	2	15
6	23	18	5	6	30	11	19
7	29	26	3	7	30	14	16
8	27	25	2	8	26	12	14
9	25	22	3	9	28	12	16
10	17	14**	3	10	16	6	10
11	17	15*	2	11	14	6	8
12	9	7	2	12	23	5	18
13	12	4	8	13	19	1	18
14	20	8	12	14	20		20
15	13	7*	6	15	12	3	9
16	7	1	6	16	15	2	13
17	4	1	3	17	15	2	13
18	5	1	4	18	4		4
19	1		1	19	1		1
20	2		2				
24	2		2				
27	1		1				
29	1		1				
30	1		1*				
43	1		1				
Total	272	190	82	Total	286	77	209

*The number of asterisks indicates the number of patients who had extractions five to ten days before the onset of polio.

individual were carefully examined for the presence of exposed pulps or residual roots with pulpal exposure. The incidence of exposed pulps in the various age groups is shown in Table 1. In order to compare the incidence of exposed pulps in individuals who did not have poliomyelitis, the mouths of 286 children and

Of the children with poliomyelitis, 190, or 69.85 per cent, gave evidence of pulpal exposure; whereas, in the group without poliomyelitis, only 77, or 26.92 per cent, had exposed pulps. To determine whether this difference of 42.93 per cent between the two groups was statistically significant, the standard er-

ror of difference was calculated.* Since the standard error of difference was found to be 3.8, and twice this difference was 7.6, the observed difference between the poliomyelitis and nonpoliomyelitis groups (42.93 per cent) was 5.6 times twice the standard error of difference. It is generally agreed that any difference between two observed groups which is more than twice the standard error of difference is statistically significant. In this case, the observed difference was 5.6 times twice the standard error of difference, and hence it is considered very unlikely that, if a much larger number of children had been examined, there would be any appreciable change in the results.

During the summer of 1944, a rather widespread epidemic of poliomyelitis occurred in Baltimore, and the authorities of two hospitals, the Kernan Hospital and Industrial School for Crippled Children and the Children's Hospital School, cooperated in permitting the examination of 103 patients. To determine the incidence of pulp exposure in children without poliomyelitis in similar age groups, 108 children in public schools 65 and 83 were examined. The incidence of pulp exposure in the various age groups in the children with and without poliomyelitis is indicated in Table 2.

It will be observed that 65.04 per cent of the children with poliomyelitis

TABLE 2.—AGE DISTRIBUTION AND INCIDENCE OF PULPAL EXPOSURE IN PERSONS WITH AND WITHOUT POLIOMYELITIS, IN BALTIMORE

Poliomyelitis Cases				Nonpoliomyelitis Cases			
Age	No. of Cases	No. Cases with Exposed Pulps	No. Cases with Pulps Not Exposed	Age	No. of Cases	No. Cases with Exposed Pulps	No. Cases with Pulps Not Exposed
3	3		3	3	3		3
4	11	5	6	4	17	2	15
5	8	5	3	5	8	2	6
6	11	10	1	6	11	3	8
7	9	8	1	7	10	5	5
8	7	7*		8	7	4	3
9	6	5	1	9	7	3	4
10	2	2		10	2	1	1
11	5	4	1	11	5	2	3
12	4		4	12	4	1	3
13	6	4	2	13	6		6
14	9	6	3	14	9	3	6
15	4	4		15	4		4
16	4	3	1	16	4		4
17	4	1	3	17	4		4
18	5	2	3	18	5		5
19				19			
23	1		1	23	1		1
25	1		1	25	1		1
26	1	1					
34	1		1				
35	1		1				
Total	103	67	36	Total	108	26	82

*One patient had extractions ten days before the onset of polio.

*Standard error of difference =

$$\sqrt{\frac{P \times Q}{N_2} + \frac{P \times Q}{N_1}}$$

had exposed pulps, while only 24.07 per cent of those without this disease showed pulp exposure. This difference of 40.97 per cent was tested for the standard error of difference, which was found to be 6.2. Since the observed difference of 40.97 per cent was 3.3 times twice the standard error of difference, it is concluded that the difference in the incidence of pulpal exposure in the two groups is statistically significant, as explained in a preceding section.

COMMENT

The experimental inoculation of monkeys with poliomyelitis virus, which resulted in the production of both paralytic and nonparalytic cases, is convincing evidence that exposed tooth pulps may readily serve as portals of entry for the virus. The fact that but one of the five animals developed paralysis does not necessarily minimize the importance of this portal of entry. In the work of other investigators wherein animals have been inoculated by the nasal or intestinal route, only a small portion of the animals develop paralysis.[5, 6, 7] Furthermore, numerous studies in human epidemics suggest that only a small number of those who become infected, either clinically or subclinically, ever develop frank paralysis.[8, 9]

If tooth pulps serve as a portal of entry in human beings, it should be expected that a higher incidence of pulpal exposure would occur among those having poliomyelitis than in similar age groups, with a similar risk of exposure, but not having the disease. The opportunity to test this supposition was made possible in an examination of the teeth in 375 cases of poliomyelitis during the epidemic of 1944 and in 394 cases within two months after the epidemic and in the same locations, in which the disease was not contracted. The incidence of exposed pulps in the group with poliomyelitis was found to be 65-70 per cent; whereas, in the group without poliomyelitis, the incidence of pulpal exposure was only 24-27 per cent. Moreover, the fact that this correlation between exposed pulps and poliomyelitis was almost identical in the two widely separated epidemics studied (Baltimore and western North Carolina) lends further support to the role of exposed pulps as portals of entry. A statistical evaluation of the incidence of pulpal exposure in persons with and without poliomyelitis indicated that the observed difference is not one of chance, but should be found similar if a much larger number of cases are studied.

A few years ago, experiments were conducted by other workers in an attempt to prevent human cases of poliomyelitis by inoculating children with presumably killed or attenuated virus and by nasal sprays of tannic acid, zinc sulfate, etc., which did not prove successful. In view of the experimental work and the results of the field studies reported in this paper, it is recommended that a similar experiment be carried out wherein all the children in the susceptible age groups in a given area have their teeth examined several months before the seasonal onset and all teeth showing pulpal exposures be treated or extracted. As a control, the teeth of the children in another area should be examined and the incidence of pulpal exposure be recorded, but no dental care administered. If such a study were conducted over several years, the importance of pulpal exposure as a portal of entry could be evaluated. It should be obvious that extraction should not be carried out too near the poliomyelitis season, as

5. Clark, P. F.; Roberts, D. J., and Preston, W. S.: J. Prev. Med., 6:47, January 1932.
6. Flexner, Simon: J. Exper. Med., 62:787, December 1935.
7. Flexner, Simon: J. Exper. Med., 63:209, February 1936.
8. Defries, R. D.: Canad. Pub. Health J., 28:424, September 1937.
9. Dauer, C. C.: Pub. Health Rep., 52: 1003, June 24, 1938.

otherwise another portal of entry might be opened, since it was noted in Tables 1 and 2 that five cases of poliomyelitis developed in persons who had extractions from five to ten days before the onset of symptoms. A sixth case,[10] which was not included in these data, developed six days after the extraction of a tooth.

It is not the intention to contend by implication or statement that the exposed pulps of teeth are the only or even the most important portal of entry for the poliomyelitis virus. Indeed, the fact that poliomyelitis occurred in 118 persons without pulpal exposure is incontrovertible evidence that other portals must exist. However, if it were assumed that exposed pulps were the only portal in the cases of poliomyelitis in this study, elimination of this portal would have prevented 74 per cent of the cases. It is impossible to estimate the number of cases in which portals other than the pulp permitted access of the virus, but a field study, as outlined above, should indicate the percentage of cases in which exposed pulps were the sole portal.

SUMMARY

1. Five *M. rhesus* monkeys were inoculated with the poliomyelitis virus in the exposed pulps of anterior teeth. One of these animals developed paralysis, while the others developed the nonparalytic disease, as indicated by the histopathologic changes characteristic of the disease in the spinal cord and semilunar ganglia.

2. The teeth of 375 persons with poliomyelitis and 394 without the disease in the same age groups and geographic area were examined for evidence of pulpal exposure. The poliomyelitis cases showed an incidence of 65-70 per cent pulpal exposures, while the individuals without this disease showed an incidence of 24-27 per cent pulpal exposures. This difference is statistically significant because it is from 3.3 to 5.6 times twice the standard error of difference.

3. It is recommended that a field study be conducted in which all the exposed pulps of one group be eliminated several months before the seasonal onset of the disease, while, in a similar control group, the incidence of pulpal exposures should be recorded, but no dental treatment administered. Such an experiment, if properly conducted, should indicate the importance of pulpal exposure as a portal of entry for the poliomyelitis virus. If exposed pulps are found to be an important portal of entry, removal of this portal by dental care before the poliomyelitis season would prevent many cases.

10. Personal communication to authors (Sept. 18, 1943) from Dr. H. E. Henry, Hickory, N. C.

POSTWAR PLANS OF DENTISTS IN SERVICE: I. GENERAL FINDINGS

C. Willard Camalier, D.D.S., and Isidore Altman,† M.S., Washington, D. C.*

This is the first of a series of reports on the postwar plans of dentists now serving with the armed forces—the Army, the Navy, the U. S. Public Health Service and the Veterans Administration. The data represent the results of a survey conducted by the War Service and Postwar Planning Committee of the American Dental Association to learn the ideas of dental officers with regard to their future. It goes without saying that such information is essential if the Asso-

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†Associate statistician, Division of Public Health Methods, U. S. Public Health Service.

ciation is to be of service in the demobilization and resettlement of dentists.

Through the cooperation of the chiefs of the respective dental services, the questionnaire reproduced on pages 571-572 was distributed among about 21,000 commissioned officers during September and October 1944. Perhaps not all were received because of the difficulties involved in reaching some of the men in far-flung outposts. By January 1, 1945, 7,549 replies had been received, containing sufficient information for purposes of statistical tabulation and analysis. The U. S. Public Health Service is assisting the War Service and Postwar Planning Committee in the task of analysis and presentation.

REPRESENTATIVE CHARACTER OF THE REPLIES

Since a reply was not received from every dentist in service, it becomes necessary to determine how representative the returns are before proceeding to an analysis of the information that they contain. Otherwise, there is no assurance that any conclusions drawn from the responses of those who filled out the questionnaires are applicable to the dental-officer population as a whole. The question is: Do those who replied constitute a reliable sample of the dentists now with the armed forces? As will be shown, the answer is a reasonably assuring affirmative.

In the first place, the return, over a third of the total number of officers, is high for a mailed questionnaire of this type to which the replies are voluntary. Secondly, percentage distributions of the replies by branch of service, by age and by state from which the officer came agree remarkably well with the corresponding distributions of the entire dental-officer population. These distributions are presented in the accompanying tables.

Table 1 shows the distribution of those who replied and of all dental officers by branch of service. The differences between the two columns of figures in the table are too small, particularly with reference to the two major services, to affect the representative character of the results. The percentage of men in each service who sent in questionnaires was as follows: Army, 34; Navy, 38; Public Health Service, 52; Veterans Administration, 61.

Table 2 shows the distribution of those who replied and of all dental officers by age. The two columns of the table, it will be observed, are almost identical.

Table 3, the percentage distribution by geographic division, indicates that, in this respect too, the replies follow the dispersion of the entire group.

The value of the survey lies in the generalizations that are drawn from it and applied to all the dentists in service. In view of the agreement between the sample and the population from which the sample came, it is believed that such generalizations can be made with confidence.

FINDINGS

In presenting the results of the postwar planning questionnaire from the American Dental Association, it is proposed to offer first what may be called the general findings—as to how the group as a whole responded to the several parts

TABLE 1.—PERCENTAGE DISTRIBUTION OF DENTAL OFFICERS REPLYING TO QUESTIONNAIRE AND OF ALL DENTAL OFFICERS ON EXTENDED ACTIVE DUTY, ACCORDING TO BRANCH OF SERVICE

Branch of Service	Dental Officers	
	Replying to Questionnaire	On Extended Active Duty
Army	67.5	70.8
Navy	29.0	27.0
Public Health Service	2.4	1.6
Veterans Administration	1.1	0.6
Total	100.0	100.0

TABLE 2.—PERCENTAGE DISTRIBUTION OF DENTAL OFFICERS REPLYING TO QUESTIONNAIRE AND OF ALL DENTAL OFFICERS ON EXTENDED ACTIVE DUTY, ACCORDING TO AGE OF OFFICERS

Age	Dental Officers	
	Replying to Questionnaire	On Extended Active Duty
Under 30	31.8	30.7
30-34	27.6	29.0
35-39	25.3	25.3
40-49	12.7	12.5
50 and over	2.6	2.5
Total	100.0	100.0

of the questionnaire. This report is to be considered a summarization of the replies, to be followed in later papers by detailed analysis of replies to particular questions and their relation to variations in characteristics among the men.

For purposes of analysis, the officers who returned questionnaires have been divided in three groups according to employment or activity prior to their entering the service. The largest group came from private practice or private practice combined with a salaried position. With regard to the latter, it was fairly obvious from the questionnaires that the salaried position was in almost all cases subordinate to the dentist's practice; hence, the combining of this group, for most purposes, with the men who confined themselves solely to private practice. The second group consists of those who came directly from dental school or internship, a small number of residents and fellows being included with the latter. The third, and by far the smallest group, is the one from full-time salaried positions —with the Federal government, with state and local health and education departments, with dental schools and hospitals or with other dental practitioners. Classified also in this group are men who were civil service employes of the Veterans Administration before receiving commissions as officers, and men who had seen sixty months or more of active service by October 1, 1944. The latter are presumed to be in the regular forces, this being as reasonable a distinction as could be made since the men were not asked, in the questionnaire, whether they were regular or reserve officers.

For the sake of convenience, each group will hereafter be designated by a letter of the alphabet: the group from private practice or private practice combined with a salaried position by the letter A; the group from dental school or internship by B, and the salaried group by C. The tables will show the group for which each letter stands.

A breakdown into five groups is shown in Table 4, in order to indicate the size of each subgroup in the combinations just indicated. Group A, containing 73 per cent of the total, is the largest of the groups. Of the 73 per cent, only 8 per cent supplemented their income by part-time salaried work. Twenty-two per cent of the men are in group B, 17 per cent having come directly from dental school and 5 per cent from an internship. Group C contains 5 per cent of the total; but it is well known that only a

TABLE 3.—PERCENTAGE DISTRIBUTION OF DENTAL OFFICERS REPLYING TO QUESTIONNAIRE* AND OF ALL DENTAL OFFICERS ON EXTENDED ACTIVE DUTY,† ACCORDING TO GEOGRAPHIC DIVISION

Geographic Division	Dental Officers	
	Replying to Questionnaire	On Extended Active Duty
New England	5.7	6.8
Middle Atlantic	29.8	31.8
East North Central	22.4	22.2
West North Central	12.3	11.8
South Atlantic	5.7	6.0
East South Central	3.3	3.2
West South Central	5.7	5.4
Mountain	2.4	2.4
Pacific	12.7	10.4
Total	100.0	100.0

*Dental officers who had been in private practice before entering service.

†Exclusive of officers in regular corps and officers who entered service from dental school.

AMERICAN DENTAL ASSOCIATION

POST WAR PLANNING QUESTIONNAIRE

Prepared by War Service Committee
Room 311, 1726 Eye St., Northwest
Washington 6, D. C.

GENERAL INFORMATION

1. Graduate of ..... (Dental School) City ..... State .....
2. Year of birth ..... 3. Year of graduation ..... 4. Year of licensure .....
5. States in which licensed .....
6. Date entered on active duty ..... 7. Number of months service .....
8. Service (check): Army ☐ Navy ☐ U. S. P. H. S. ☐ Vet. Admn. ☐

CIVILIAN STATUS BEFORE ENTERING SERVICE

(Check appropriate items)

9. Entered service from: Dental school ☐ Internship ☐ Private practice ☐
   Private practice combined with salaried position ☐ Salaried position ☐
10. Community of practice: City ..... State .....
    If from private practice or private practice combined with salaried position
11. Type of practice: General ☐ Special ☐ Specify specialty .....
12. Number of full-time hygienists employed .....
13. Number of full-time asistants (non-dentists) employed .....
14. Number of full-time dentists employed .....
15. Number of complete dental outfits now owned .....
    (a) Additional items required:
    Chairs ☐ Units ☐ Engines ☐ X-Ray Machines ☐
    Other ☐ (specify) .....
    If from salaried position or private practice and salaried position
16. Place of employment: Dental school ☐ Hospital ☐ Industry ☐
    State or local Department of Health or of Education ☐
    Government ☐ (specify) .....
    Employed by dentist ☐ Other ☐ (specify) .....

POST WAR PLANS

(Check appropriate items)

17. Do you plan to receive additional training after discharge from service? Yes ☐ No ☐
18. If yes, training desired:
    Refresher course ☐ Specify length of course (months) .....
    Post-graduate course ☐ Specify length of course (months) .....

Figure 1.

19. Fields of training desired:

Orthodontia ☐	Prosthetic ☐	Anesthesia ☐
Periodontia ☐	Crown-Bridge ☐	Plastic surgery ☐
Oral surgery ☐	Children ☐	Public Health ☐
Operative ☐	X-ray ☐	Other ☐ ..... (Specify)

20. Where would you prefer to study?

..... (Name of institution) ..... (City) ..... (State)

21. Do you plan to teach? Yes ☐ No ☐

22. Specify field of teaching .....

23. Would you take a position as a dentist in industry? Yes ☐ No ☐

24. If yes, full-time ☐ part-time ☐

25. Would you take a position in a State or local health department, school clinic, etc.? Yes ☐ No ☐

If yes, (specify) .....

26. Do you desire to remain in government service? Yes ☐ No ☐

27. If yes, Army ☐ Navy ☐ U. S. P. H. S. ☐ Veterans Administration ☐

28. Do you plan to engage in private practice? Yes ☐ No ☐

29. If yes, in former locality ☐ in new locality ☐

30. If new locality, what is your preference:

Name State .....

Size of community: Under 5,000 ☐ 5,000-25,000 ☐ 25,000-100,000 ☐ Over 100,000 ☐

31. Would you like to become associated in private practice with a group of dentists? Yes ☐ No ☐

32. Would you go to an area needing dentists if you were provided with: an office ☐ a subsidy ☐ a loan ☐ (one or more may be checked).

33. List the important ways in which the American Dental Association can aid the returning dental officer:

.....

.....

.....

.....

.....

.....

.....

.....

..... (Sign or not, as you prefer)

(Return completed questionnaire to War Service Committee, American Dental Association, Rm. 311, 1726 Eye St., N.W. Washington 6, D. C.

Figure 2.

small part of the dental profession is normally engaged in activity other than private practice.

Primary interest in the survey centers in what the men plan to do when the war is over and the bulk of them are released from military duty. It is not possible or very wise to say that a given number will enter or return to private practice; that so many will remain in service, and so many will take positions with health departments or in industry. How definitely a man in service can make up his mind about his future at this time is problematic, and there is no way of knowing precisely the number and kinds of positions that will be open to those who do not at present intend to enter private practice. The dental officers, therefore, were not required to limit themselves to a single choice—engaging in private practice, seeking a full-time position, staying in service—but, as the wording of the questionnaire makes evident, could check more than one type of employment. For these reasons, it must be borne in mind throughout that many men who were entering private practice, as they declared, also gave affirmative answers to one or more of the other questions on plans for the future. The replies should nevertheless approximate the proportions of dental officers engaging, after the war, in the different activities about which the questionnaire made inquiry. This is particularly true with regard to private practice.

TABLE 4.—NUMBER AND PERCENTAGE DISTRIBUTION OF DENTAL OFFICERS REPLYING TO QUESTIONNAIRE, ACCORDING TO STATUS BEFORE ENTERING SERVICE

Entered Service from:	Dental Officers	
	Number	Percentage Distribution
Private practice (A)*	4,919	65.2
Private practice combined with a salaried position (A)	576	7.6
Dental school (B)	1,262	16.7
Internship (B)	409	5.4
Salaried position (C)	383	5.1
Total	7,549	100.0

*The letters are the group connotations to be employed hereafter; i.e., dental officers who came from private practice or private practice combined with a salaried position will form group A; those from dental school or internship, group B; those from salaried positions, group C.

1. *Private Practice.*—A percentage distribution of the replies on the question of private practice is shown in Table 5. Of the men who came from private practice (group A), 93 per cent intend to return to practice, 3 per cent are undecided about returning and 2 per cent declare an intention not to return. The questionnaire did not provide for qualified replies. If it had, this percentage and all figures in this paper on number and percentage doubtful, undecided and the like, would be somewhat different. The percentages are shown separately for their indicative value. In connection with groups, it is important to note that 22 per cent do not intend, at this time, to return to their former communities, but mean to establish practice in new localities and another 9 per cent are apparently in some doubt about returning to their previous places of practice. It is proposed to show and discuss in a later paper the number who desire to go to new states, to different parts of the country, to communities of larger or smaller size, etc.

The percentage distribution as to future plans in relation to private practice is the same for the men who came from dental school and internship as for those who had already experienced some practice. In this respect at least, there seems to be no significant difference in outlook between the two groups. Most of the men in group C, on the other hand, anticipate returning to former or other salaried positions. Half of this group consists of men who have been in active duty for more than five years (as of October 1, 1944) or were civil service

TABLE 5.—PERCENTAGE DISTRIBUTION OF DENTAL OFFICERS ACCORDING TO POSTWAR PLANS WITH REGARD TO PRIVATE PRACTICE

Plans for Private Practice	All Dental Officers	Status Prior to Active Service		
		A Private Practice	B Dental School or Internship	C Salaried Position
Plan to engage in private practice:				
In former community	44.8	61.6	—	—
In new community	38.6	22.1	92.3	41.0
Undecided as to community	6.5	8.9	—	—
Undecided about engaging in private practice	3.5	3.5	2.5	9.4
Do not plan to engage in private practice	4.7	2.2	3.5	44.6
No answer	1.9	1.7	1.7	5.0
Total	100.0	100.0	100.0	100.0
Number of dental officers	7,549	5,495	1,671	383

employes of the Veterans Administration. Of these, only 20 per cent expressed any interest in private practice.

Table 6 shows the distribution of the men going into private practice according to size of community to which they are returning or in which they intend to open a new office. About 38 per cent will go to the large cities—of 100,000 population or more—24 per cent to cities of 25,000-100,000, 28 per cent to cities of 5,000-25,000 and only 10 per cent to smaller communities. These data are to be contrasted with the distribution of the population by city size. The Census of 1940 found 45 per cent of the urban population, including persons in incorporated places regardless of size, living in cities of 100,000 or more, 18 per cent in cities of 25,000-100,000, 20 per cent in cities of the 5,000-25,000 class and 17 per cent in the remainder. Thus, the distribution of returning dentists can hardly be said to follow that of the urban population. The cities of between 5,000 and 100,000 population are to receive a greater number of dentists, while the largest and smallest cities are to receive a smaller number in proportion to population. The shortage of dentists in places with fewer than 5,000 persons, and hence in our rural areas, is seemingly to continue.

2. *Group Practice.* — The question "Would you like to become associated in private practice with a group of dentists?" is admittedly somewhat vague and lends itself to varying interpretations; but it was believed that to put the question more specifically or to have included

TABLE 6.—PERCENTAGE DISTRIBUTION OF DENTAL OFFICERS BY SIZE OF CITY OF INTENDED PRACTICE

Size of City (Population)	All Dental Officers	Status Prior to Active Service		
		A Private Practice	B Dental School or Internship	C Salaried Position
Under 5,000	9.6	10.9	5.1	6.0
5,000- 25,000	28.0	25.9	34.3	44.7
25,000-100,000	24.2	22.9	29.2	23.3
100,000 and over	38.2	40.3	31.4	26.0
Total	100.0	100.0	100.0	100.0
Number of officers giving information	6,424	4,998	1,276	150

a limiting definition would have run counter to the attempt to formulate a simple and straightforward questionnaire. The question was inserted to obtain some idea of the interest among returning dentists in practicing other than singly; to learn how many were giving consideration to the possible pooling of specialties, skill and equipment.

In view of the strong tradition of individual practice, the number expressing an interest in group practice is high. Between a fifth and a quarter of the officers answered the question in the affirmative (Table 7) and a small fraction indicated that they were undecided. The difference in regard to group practice between men from dental school and those from private practice is small; but it is to be noted that the percentage interested was somewhat higher (28 per cent) among the former, who are by and large the younger men, than among the latter (22 per cent).

3. *Location of Practice in Areas Needing Dentists.*—The War Service and Postwar Planning Committee, in asking question 32, had in mind the problem of unequal distribution of dentists and its possible solution on a voluntary basis. The committee therefore sought an estimate of the number of men willing to locate in areas of shortage under various forms of inducement: provision of an office, payment of a subsidy, advance of a loan or a combination of these three.

When an officer checked more than one item on the questionnaire, say "office" and "subsidy," it could not be determined whether he meant that he would go to an area in need of dentists if furnished with both an office and a subsidy or with either. The various combinations of items checked are therefore shown in Table 8, together with a recapitulation in Table 9 of the number checking each item. Of the several combinations, office and subsidy were checked most often in all groups, with an overall percentage of 9. Of the individual items, provision of an office seemed most important, being checked by 23 per cent of all the men.

Perhaps the most important items in the table are the totals; i.e., the percentages who indicated some kind of interest in going to areas needing dental practitioners. Almost 40 per cent of the men in group B checked 1 or more items as compared with 25 per cent of the men in group A. This is partly explained by the fact that a substantial portion of the latter are returning to their established practices and own all or a good part of the necessary—and very costly—equipment. Moreover, a number wrote in on their questionnaires that the localities to which they were going *were* areas needing dentists.

4. *Government Service.*—It was clear from the questionnaire (items 26 and 27) that this part referred to service on

TABLE 7.—PERCENTAGE DISTRIBUTION OF REPLIES TO QUESTION REGARDING POSSIBLE DESIRE TO BECOME ASSOCIATED IN PRIVATE PRACTICE WITH A GROUP OF DENTISTS

Reply to Question	All Dental Officers	Status Prior to Active Service		
		A Private Practice	B Dental School or Internship	C Salaried Position
Yes	23.1	22.1	27.8	16.4
Undecided	3.1	3.3	2.5	2.9
No	65.7	66.9	61.9	66.1
No answer	8.1	7.7	7.8	14.6
Total	100.0	100.0	100.0	100.0
Number of dental officers	7,549	5,495	1,671	383

TABLE 8.—PERCENTAGE OF DENTAL OFFICERS WHO WOULD GO TO AREA NEEDING DENTISTS IF PROVIDED WITH BENEFITS SPECIFIED

Items Checked	All Dental Officers	Status Prior to Active Service		
		A Private Practice	B Dental School or Internship	C Salaried Position
Office	7.7	6.8	10.7	9.4
Subsidy	2.9	3.4	1.8	0.3
Loan	1.2	0.9	2.0	1.8
Office and subsidy	9.2	7.9	13.1	11.0
Office and loan	3.6	2.8	6.1	4.2
Subsidy and loan	.7	0.7	0.7	0.5
Office, subsidy and loan	2.7	2.3	3.8	3.1
Total	28.0	24.8	38.2	30.3

a commissioned basis with the Army, Navy, U. S. Public Health Service or Veterans Administration. Of group C, about 60 per cent expressed a desire to remain in service (Table 1C); but, of this group, 28 per cent are men with five years or more of active duty and, as stated, presumed to be in the regular corps of their respective services. Another 20 per cent are in the Veterans Administration. Virtually all of these intend to remain in service; but, in the two large groups, A and B, the percentage desiring to remain in service is rather small.

It is particularly to be noted that the percentage in group B answering in the affirmative is one-half the percentage in group A.

5. *Position in Industry.*—Table 11 shows the proportion of dentists who would take positions in industry. The percentage of the entire group willing to take full-time positions is 9. For group B, the percentage willing to take such positions is 6, less than that of either of the other groups. The same group shows the highest percentage (22.0) willing to take part-time jobs—as a financial help, probably, to establishment of a private practice. Industrial dentistry is still a relatively undeveloped field and may not offer much opportunity at present. The number interested in such positions may very well increase as the field grows.

6. *Teaching.*—The percentage in each group who plan to teach is small, even though many seem to have interpreted this to mean "would like to teach." The percentage for group A is 6.6; for group B, it is 7.5, and for group C, into which would fall former full-time teachers, it is 8.4.

One probable reason for the small percentages is that teaching has not in the past been highly remunerative and men have been loath to sacrifice opportunities in private practice. It may be that the demands of returning dentists for refresher courses and advanced schooling will create a need for teachers that will serve to attract more dentists to this field.

TABLE 9.—PERCENTAGE OF DENTAL OFFICERS CHECKING EACH OF SPECIFIED ITEMS, ALONE OR IN COMBINATION WITH OTHERS

Office	23.2	19.8	33.7	27.7
Subsidy	15.5	14.3	19.4	14.9
Loan	8.2	6.7	12.6	9.6
Number of dental officers	7,549	5,495	1,671	383

TABLE 10.—PERCENTAGE DISTRIBUTION OF DENTAL OFFICERS ACCORDING TO DESIRE TO REMAIN IN GOVERNMENT SERVICE

Reply to Question	All Dental Officers	Status Prior to Active Service: A Private Practice	B Dental School or Internship	C Salaried Position
Desire to remain in service	15.2	14.7	7.1	58.5
Undecided	4.9	5.4	3.6	4.4
Do not desire to remain in service	77.1	76.9	86.8	35.8
No answer	2.8	3.0	2.5	1.3
Total	100.0	100.0	100.0	100.0
Number of dental officers	7,549	5,495	1,671	383

The subjects specified most frequently by those planning to teach were oral surgery (by 29 per cent), dental prosthesis (17 per cent), operative dentistry (13 per cent) and orthodontia (7 per cent).

7. *Other Salaried Positions.*—In this category fall positions in state and local health and education departments, in school and charitable clinics, in hospitals and the like. By group, the percentages who would take such positions were as follows: group A, 27 per cent; group B, 35 per cent; group C, 25 per cent. The percentage for all groups combined was 29. In each group, an additional small percentage indicates that they were undecided.

It is important to point out, in connection with this type of employment, that, when answering the question, most of the dental officers apparently had part-time positions in mind. Of the officers who were interested in a health department, a clinic or an allied position, 90 per cent stated that they were entering private practice.

8. *Training After Separation from Service.*—More than 70 per cent of the respondents to the questionnaire indicated a desire for some kind of postwar training, and an additional 7 per cent made qualified replies indicating an interest in training (Table 12). The differences between groups A and B in the desire for training are small, while the percentage desiring training in group C is understandably much smaller. It is interesting to observe, in comparing groups A and B, that the latter tend to lean toward postgraduate courses to a greater extent than do the men from private practice. In group B, 45 per

TABLE 11.—PERCENTAGE OF DENTAL OFFICERS WHO WOULD TAKE POSITION IN INDUSTRY

Kind of Position	All Dental Officers	Status Prior to Active Service: A Private Practice	B Dental School or Internship	C Salaried Position
Full-time position	8.9	9.5	5.9	14.1
Part-time position	17.3	16.4	22.0	9.1
Kind of position not specified	0.5	0.5	0.4	1.0
Undecided about position	4.4	4.8	3.5	2.7
Total	31.1	31.2	31.8	26.9
Number of officers*	7,549	5,495	1,671	383

*The following percentages of these numbers failed to answer the question: all dental officers, 5.0; group A, 4.8; group B, 4.7; group C, 10.4.

TABLE 12.—PERCENTAGE DISTRIBUTION OF DENTAL OFFICERS ACCORDING TO PLAN FOR ADDITIONAL TRAINING AFTER DISCHARGE FROM SERVICE

Training Desired	All Dental Officers	Status Prior to Active Service		
		A Private Practice	B Dental School or Internship	C Salaried Position
Planning additional training:				
Refresher courses	26.4	28.1	23.2	17.0
Postgraduate courses	36.9	35.1	44.5	30.1
Refresher and postgraduate courses	9.6	9.3	11.2	5.0
Medical school	0.4	0.3	0.7	0.3
Total planning for training	73.3	72.8	79.6	52.4
Undecided	7.1	7.5	5.1	10.5
No additional training planned	18.2	18.6	13.5	33.2
No answer	1.4	1.1	1.8	3.9
Total	100.0	100.0	100.0	100.0
Number of dental officers	7,549	5,495	1,671	383

cent checked such courses as against 35 per cent in group A.

Oral surgery was the field of training checked most often (Table 13). For all groups combined, it was checked by 47 per cent of the men (59 per cent of those desiring training). It was checked by 57 per cent of group B; whereas prosthodontia, the field second in order, was checked by 39 per cent of this group. From Table 13, in which the fields are arranged in order of frequency with which checked, it may be seen that even the lowest were marked by a substantial number of officers. In addition, a number of subjects were written in—office management, acrylics and root canal therapy. (Exodontia was combined with oral surgery.)

In addition to checking fields of training, the officers were asked to indicate the institution at which they preferred to study. Suffice it at present to say that those who did make a choice named most often their school of graduation or a school located close to their intended place of practice.

9. *Need for Equipment.*—Item 15 (a) on the questionnaire, "Additional items required," was answered by only about half of the men returning questionnaires. It is therefore necessary to make some reasonable adjustment of the data for those who failed to answer, particularly since the largest percentage failing to answer was in group B.

Such adjustment is best made by adding to those who definitely stated a need for equipment the number intending to enter private practice on discharge, but not owning a dental outfit. The results are summarized in Table 14. About 45 per cent of nearly 7,000 dental officers who indicated that they will practice own complete outfits and did not indicate the need for additional items; 19 per cent own outfits, but will want additional major equipment, and 36 per cent do not own complete outfits, but will presumably require them for practice.

The last two percentages added together indicate that 55 per cent of the men entering private practice will require equipment with which to begin or resume practice.

SUMMARY

The War Service Committee of the American Dental Association has conducted a survey among all dentists serving with the armed forces regarding postwar plans. More than one third of the dental officers filled in and returned

TABLE 13.—PERCENTAGE OF DENTAL OFFICERS DESIRING SPECIFIED COURSES OF TRAINING

Courses of Training	All Dental Officers	Status Prior to Active Service		
		A Private Practice	B Dental School or Internship	C Salaried Position
Oral surgery	47.3	45.2	57.3	33.7
Prosthetic	39.0	39.7	39.4	26.9
Crown-bridge	25.7	24.9	31.2	13.6
Anesthesia	21.7	20.6	27.5	12.8
Orthodontia	17.3	16.4	21.7	11.7
Periodontia	9.7	9.6	11.2	3.9
Plastic surgery	8.3	7.4	11.2	8.4
Operative	7.3	8.1	4.8	6.3
X-ray	6.8	7.2	6.2	5.2
Children's dentistry	5.7	5.6	6.6	2.9
Public health	3.6	3.9	2.4	5.2
Other	2.7	2.9	1.9	3.1
Number of dental officers	7,549	5,495	1,671	383

their questionnaires. The present report shows that those who replied are representative of the whole dental-officer population and summarizes the more important aspects of the data.

1. *Private Practice.*—Ninety per cent of the men will engage in private practice after separation from the service. Of the men who were in practice before entering active service, 62 per cent will return to their former communities, 22 per cent will go to new communities and 9 per cent are undecided about returning to their former places of practice. Cities between 5,000 and 100,000 population will receive a greater number of dentists in relation to population than will the largest and smallest cities.

2. *Group Practice.*—About a fourth of the dental officers said they would like to become associated in private practice with a group of dentists. The percentage interested was somewhat higher among the men who went into service directly from dental school than among the men from private practice or a salaried position.

3. *Location of Practice in Area Needing Dentists.*—The question was, "Would you go to an area needing dentists if provided with: an office ———, a subsidy ———, a loan ———?" One or more of these items were checked by 28 per cent of the officers. Each item, by itself or in combination with one or both of the others, was checked as follows: "office," 23 per cent; "subsidy," 16 per cent; "loan," 8 per cent.

4. *Government Position.*—This referred to the continuation of active status after the war. While, in the group as a whole, 15 per cent said that they desired to remain in service, the per-

TABLE 14.—DISTRIBUTION OF DENTAL OFFICERS ACCORDING TO NEED FOR DENTAL OUTFITS*

Status with Regard to Dental Outfits	Number of Dental Officers	Percentage Distribution
Own complete outfit:		
Do not indicate need for additional outfit	3,159	44.8
Indicate need for additional outfit†	1,352	19.1
Do not own complete outfit	2,546	36.1
Total	7,057	100.0

*Based on replies from dental officers who are presumably entering private practice after the war.

†Based on number checking the item "chairs." Approximately the same number checked the item "units" and a somewhat smaller number checked "engines" and "x-ray."

centage in the group of new graduates was 7.

5. *Position in Industry.*—Nine per cent of the men would accept full-time positions and 17 per cent would accept part-time positions in industry. Five per cent were undecided about accepting a position in industry or failed to specify the kind of position that they would accept.

6. *Teaching.*—About 7 per cent of the dental officers would be interested in teaching positions. The most frequently specified subjects were, in order: oral surgery, dental prosthesis, operative dentistry and orthodontia.

7. *Other Salaried Positions.*—Included in this category are positions in state or local health departments, in school clinics, etc. The percentage who would accept such positions was 29, but the fact that 90 per cent of these men are entering private practice would indicate that most would accept only part-time positions.

8. *Training After Discharge from Service.*—Additional training will be sought by more than 70 per cent of the men. "Postgraduate course" was checked by 37 per cent and "refresher course" by 26 per cent. Ten per cent checked both refresher and postgraduate courses. Oral surgery was the field of training most frequently indicated, being checked by about half of all those replying to the questionnaire. Following in order were prosthetic dentistry, crown and bridge work, anesthesia, orthodontia and periodontia.

9. *Need for Equipment.*—It is estimated from the data that 55 per cent of all dental officers entering private practice after the war will require new outfits. This percentage is made up of 36 per cent who do not own an outfit and 19 per cent who own an outfit now, but indicated that they will want additional or new outfits when they return to practice.

The last item on the questionnaire requested a list of the important ways in which the American Dental Association can aid the returning dental officer. The replies were too varied to permit satisfactory tabulation by machine methods and therefore a hand tabulation of the remarks had to be resorted to. As this is a time-consuming procedure, the results will appear at a later date. It can be stated now that the topics mentioned most often were: an opportunity for returning dentists to obtain government surplus equipment directly and at fair discount, preference for veterans in the matter of licensure, opposition to so-called socialized dentistry, assistance in the way of loans and information regarding suitable locations.

YEARLY INCIDENCE OF DENTAL NEED IN ADULTS*

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At the present time, little is known, for the United States as a whole, about the total number of persons afflicted, or the extent to which they suffer attack, by dental disease. How much need for dental service now prevails and how much arises anew each year among the entire American population are, therefore, matters that warrant investigation. It is generally agreed that quantitative data on the nature and amount of dental service needed by the population must be assembled before the planning of dental programs can be placed

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†Senior Dental Officer, United States Public Health Service.

on a rational basis. Material of that character is now at hand for children of certain localities[1-3] and information about the prevalence of existing need has been made available by the Committee on Economics of the American Dental Association for a sample of adult dental patients.[4] In contrast, little information is available on the new need that is to be expected annually; that is, the incidence of need for dental service among the adult population.

The yearly incidence of need for dental service in the whole population could be ascertained by following and diagnosing the condition of everybody frequently throughout a lifetime. In such a procedure, the kinds of diagnosis made (the types of dental service recommended for specific conditions) would be those that a consensus would designate as desirable. Such an approach to the measurement of the incidence of need is obviously impossible, since it would require that every one visit a dentist at frequent intervals

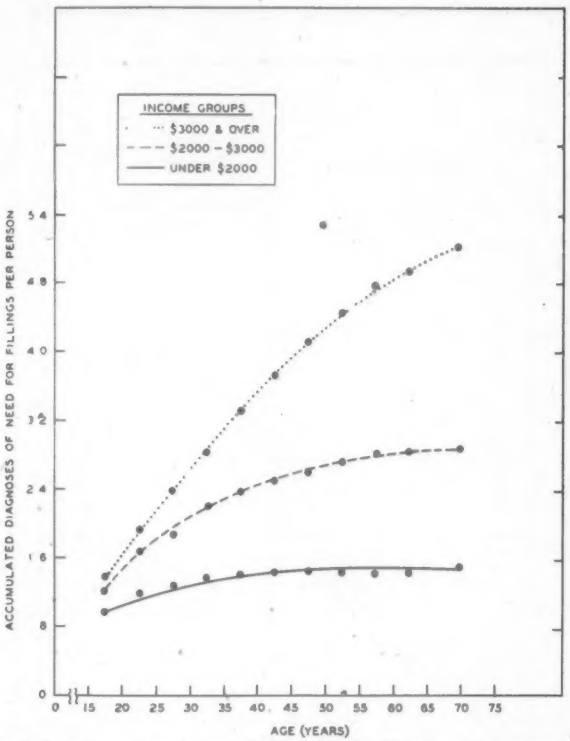

Fig. 1.—Relationship of age and accumulated diagnoses of need for fillings per person; by socio-economic status.

1. Klein, Henry, and Palmer, C. E.: Dental Problems of Elementary School Children. Milbank Mem. Fund Quart., 16:267, July 1938.

2. Klein, Henry; Palmer, C. E., and Knutson, J. W.: Studies on Dental Caries. I. Dental Status and Dental Needs of Elementary School Children. Pub. Health Rep., 53:1021, June 24, 1938.

3. Sloman, E. G., and Sharp, J. B.: Extent of Dental Caries and Condition of Teeth of San Francisco High School Students. California D. A. J., 15:89-120, May-June 1940.

throughout a lifetime to have diagnoses recorded, needs assayed and specific services recommended. Diagnosis is frequent only in a small proportion of the population, those of relatively high incomes. However, indirect methods of analysis can be used to obtain some approximate idea of the magnitude of the load of dental work that is necessary to care for annual new needs. The present report is concerned with descriptions of such a method and of the results obtained by its use.

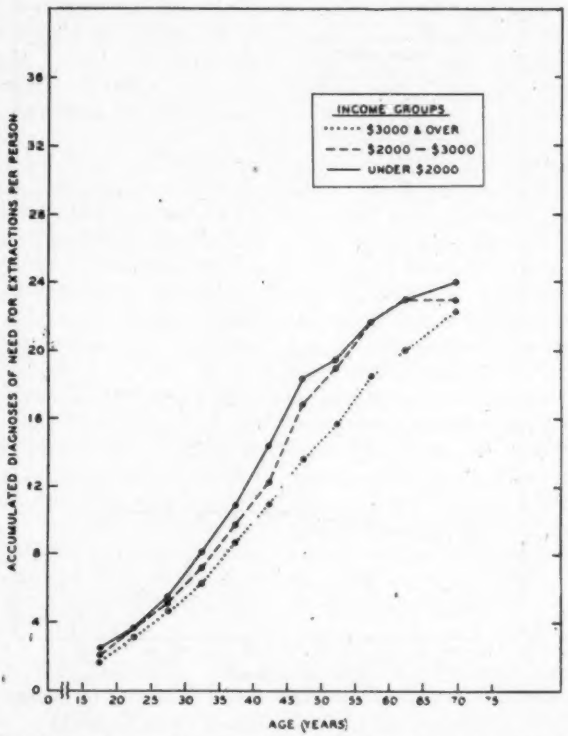

Fig. 2.—Relationship of age and accumulated diagnoses of need for extractions per person; by socio-economic status.

MATERIAL

Quantitative information on the incidence of dental need is obtained in the present report through a combination of two main categories of data now available in the literature. These consist of (a) material on the amount of dental need serviced (and therefore diagnosed) in a given year among a sample of persons of all ages and (b) material on the volume of existing need (and therefore residual need requiring service) diagnosed in another sample of persons of comparable age, sex and socio-economic composition. These data are to be found in two publications hereinafter designated as the ADA and the CCMC reports.[4, 5]

4. Walls, R. M.; Lewis, S. R., and Dollar, M. D.: Study of Dental Needs of Adults in United States. Chicago: American Dental Association, 1940.

These data have their serious limitations. They do not include information on persons other than white and they do not cover a complete array of the dental services that the population needs. The analysis given here provides estimates that, it is fair to say, represent only first approximations of (a) the load of dental work that the population desires to purchase in a given year under prevailing circumstances and conditions, (b) the amount of service that they do purchase in a given year and (c) the volume of service that they would require if they all had a complete diagnosis at frequent intervals and secured all the services that the dentists recommended at the time of diagnosis. Since no estimates based on quantitative sampling have heretofore been made available on the volume of diagnosis (services received plus services recommended) among the population, the material and analysis presented here are described at some length for the purpose of providing those estimates that may be found useful in planning to meet the dental problem of the United States population.

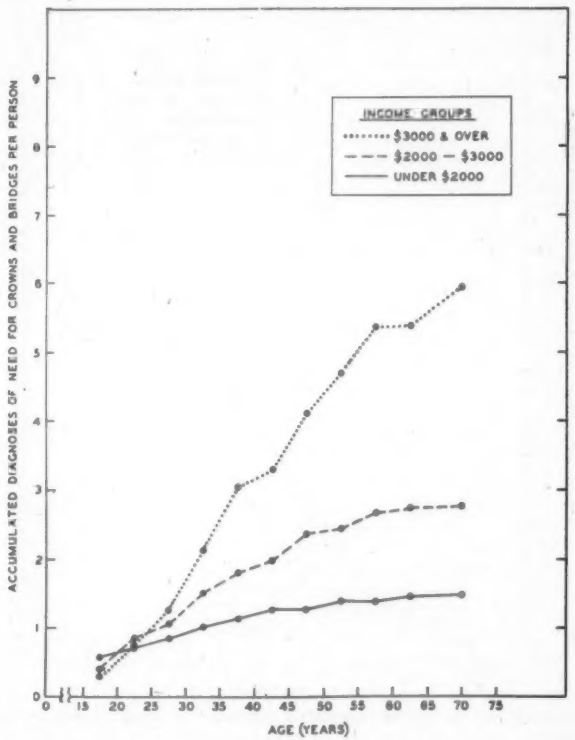

Fig. 3.—Relationship of age and accumulated diagnoses of need for crowns and bridges per person; by socio-economic status.

The ADA Report.—The stated purposes of the report of Walls, Lewis and

5. Collins, S. D.: Frequency of Dental Services Among 9,000 Families Based on Nation-Wide Periodic Canvasses, 1928-1931. Pub. Health Rep., 54:629, April 21, 1939.

Dollar were "to determine the average existing dental needs of adults 15 years of age and over and to investigate the relative existing dental needs of persons on different economic levels." It is further stated that 55,000 questionnaires were sent to 11,000 dentists. The report continues:

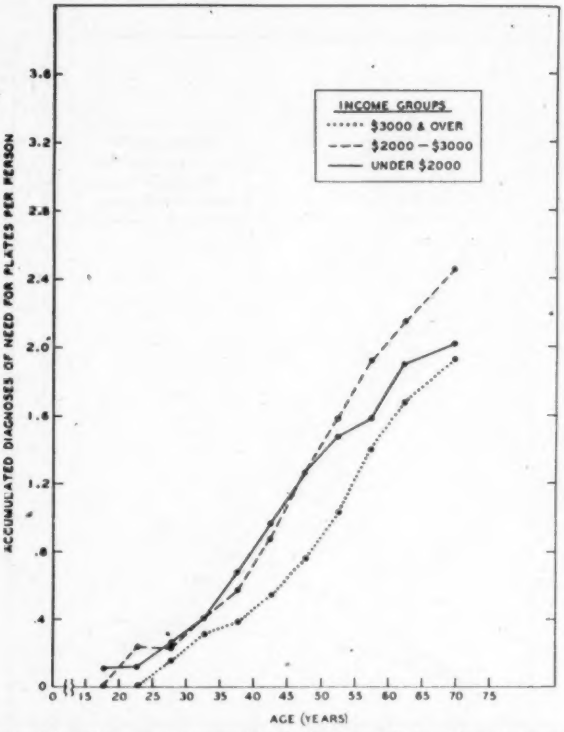

Fig. 4.—Relationship of age and accumulated diagnoses of need for dentures per person; by socio-economic status.

Five cards were sent to each dentist with instructions to select the first two patients, 15 years of age or over, calling during the morning and afternoon office hours, and the first three patients of that age group calling during the evening hours of a particular day in May 1940. Approximately 1,600 dentists cooperated, returning a total of 7,541 schedule cards.

The geographic distribution of the sample was quite similar to that of the whole population and very close to the distribution of the population according to size of community. A few Negroes and other persons of races other than white were included in the sample, but they form less than 0.5 per cent of it. The findings of the survey may, therefore, be considered to concern a white population.

However, the ADA sample is probably biased in the direction of the higher economic levels, and with regard to frequency of visits to dentists. For example, about 65 per cent of the ADA sample were of the income group "under $2,000," while close to 80 per cent of the general white population fell in that in-

come group, according to the National Health Survey.[6] It is recognized that the socio-economic composition of the population may have changed between the time of the National Health Survey in 1936 and the time of the ADA survey in 1939. In fact, information on money spent for dental services indicates that such a change did occur, since expenditures for dentistry rose from around 312 to $350,000,000 between the two survey years. Again, almost 60 per cent of the persons included in the ADA sample visited a dentist within the year (1939) previous to the time of that survey; whereas only about 44 per cent of a general population of more than 60,000 white persons canvassed in the winter of 1935-1936 by the National Health Survey[7] reported visiting a dentist within the preceding year. Furthermore, fewer than 2 per cent of the ADA sample reported that they had never visited a dentist before, as compared with 19 per cent of persons canvassed by the National Health Survey. Thus, it appears that the ADA survey involved a selection of persons in the

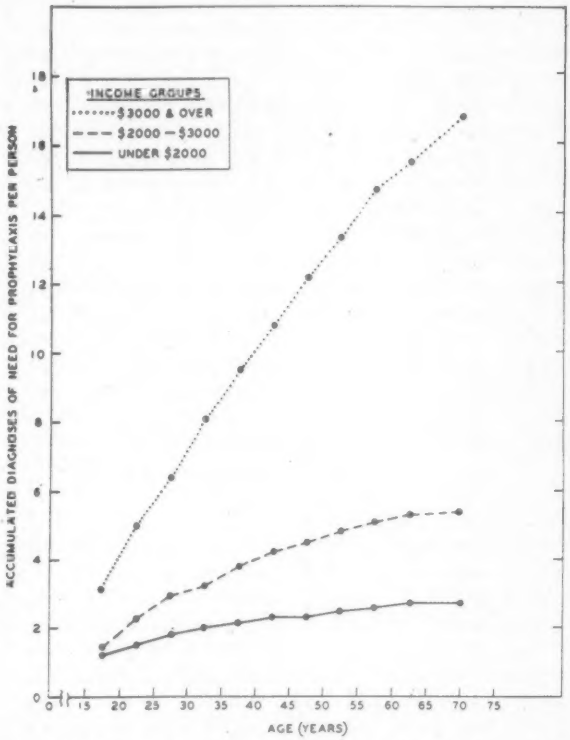

Fig. 5.—Relationship of age and accumulated diagnoses of need for prophylaxes per person, by socio-economic status.

6. Perrott, G. St.J.; Tibbitts, C., and Britten, R. H.: National Health Survey, Scope and Method. Pub. Health Rep., 54:1663, September 15, 1939.

7. Britten, R. H.: Study of Dental Care in Detroit, Michigan. Pub. Health Rep., 53:446, March 25, 1938.

TABLE 1.—EXISTING NEED FOR DENTAL SERVICES OF SPECIFIED TYPES, PER PERSON OF EITHER SEX, AND OF SPECIFIED AGE AND ANNUAL INCOME GROUPS*

Age	Socio-Economic Status																								
	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over
	Existing Need per Person																								
	Fillings			Extractions			Crowns and Bridges			Dentures			Prophylaxes Cases			Root Canal Cases			Pyorrhea Cases			Vincent's Cases		
15-19	6.6	6.6	5.7	1.2	0.7	0.4	0.5	0.3	0.2	0.1	0.0	0.0	0.8	0.8	0.7	0.05	0.05	0.06	0.04	0.05	0.00	0.01	0.00	0.01
20-24	6.5	7.0	5.2	1.4	1.2	1.0	0.6	0.6	0.4	0.1	0.2	0.0	0.8	0.8	0.8	0.04	0.08	0.04	0.07	0.06	0.09	0.02	0.03	0.04
25-29	5.6	5.2	4.8	1.7	1.1	0.8	0.6	0.6	0.4	0.2	0.1	0.1	0.8	0.8	0.7	0.03	0.03	0.07	0.12	0.08	0.16	0.04	0.01	0.11
30-34	5.1	5.2	4.1	2.4	1.4	0.9	0.6	0.7	0.6	0.3	0.2	0.2	0.7	0.6	0.8	0.02	0.04	0.05	0.16	0.11	0.14	0.01	0.01	0.01
35-39	3.9	4.1	4.1	3.0	1.7	1.3	0.6	0.7	0.8	0.5	0.3	0.2	0.6	0.7	0.8	0.02	0.03	0.04	0.20	0.18	0.19	0.02	0.01	0.00
40-44	3.0	3.5	3.8	4.1	1.6	1.6	0.6	0.6	0.7	0.7	0.5	0.3	0.6	0.7	0.7	0.03	0.04	0.04	0.15	0.23	0.18	0.01	0.01	0.02
45-49	2.4	2.4	3.3	5.7	3.6	2.0	0.4	0.7	0.6	0.9	0.7	0.4	0.4	0.6	0.7	0.02	0.03	0.03	0.18	0.12	0.16	0.01	0.01	0.01
50-54	1.8	2.2	2.7	4.6	3.5	1.7	0.4	0.5	0.6	1.0	0.8	0.5	0.4	0.6	0.6	0.01	0.02	0.03	0.16	0.22	0.22	0.01	0.01	0.00
55-59	1.1	1.8	2.6	5.0	3.7	2.5	0.2	0.5	0.8	1.0	0.9	0.7	0.4	0.6	0.7	0.01	0.00	0.05	0.10	0.09	0.18	0.01	0.01	0.00
60-64	0.6	1.3	1.5	4.9	3.4	1.9	0.2	0.4	0.3	1.2	0.9	0.8	0.4	0.5	0.5	0.00	0.00	0.02	0.08	0.16	0.22	0.01	0.00	0.00
65 and over	1.0	1.1	1.8	4.5	1.7	1.7	0.1	0.2	0.5	1.2	1.0	0.7	0.4	0.3	0.6	0.00	0.04	0.04	0.09	0.16	0.06	0.01	0.00	0.00

*Among more than 7,500 adults examined under the auspices of the Committee on Economics of the American Dental Association. (Material adapted from the ADA report.)

higher economic groups. It is necessary to point out also that the ADA sample did not include any persons not visiting a dentist. Obviously, the existing needs of persons not attending dentists' offices could not be measured by the ADA survey, which was based on patients visiting dentists' offices.

It should be recognized that such persons as were included in the ADA sample (dental patients visiting a dentist at frequent intervals) may have a tendency to need more dental service, as contrasted with persons visiting a dentist only occasionally or not at all. Frequency of visits to a dentist may be a function of the frequency of attack by dental disease. From that point of view, the accumulated volume of diagnosis among the ADA sample may be somewhat higher than that of the general population. Balancing that possible characteristic is the probability that because of more frequent diagnoses (and perhaps service), the existing need of the ADA sample may be equal to or less than that of the general white population. (The ADA rates could not be adjusted so as to include those people who do not visit dentists' offices, since no findings are available on their existing dental needs.)

In a later section of the present report, it will be shown that persons of low economic status do not receive dental diagnoses and service very frequently; that is, they visit a dentist's office only occasionally, if at all. Thus, the existing need tends to become higher as the economic status is lowered. Since the over-all economic status of the general white population is lower than that of the ADA sample, it may be assumed that the existing need of the general white population would be somewhat higher than that found for the ADA population.

In the ADA report, the existing needs, reported on a per person (patient visiting a dentist) basis, cover the following categories: all types of fillings, crowns, indicated extractions and impactions. Also, there is given the percentage of cases needing the following services: bridges, dentures (full and partial), prophylaxes and root canal therapy; or treatment for the following conditions: pyorrhea and Vincent's infection. These are converted into per person rates. (Table 1.)

The CCMC Report.—The purpose of the report (Collins) was in part ". . . to show the volume of dental services of specific kinds received annually by various classes of the population." The basic materials were obtained from white families in 130 localities in eighteen states. The nature of all dental service received was recorded, with details as to whether it consisted of fillings, extractions, the placing of crowns, bridges or dentures, or prophylaxes. The families surveyed included a total of more than 38,000 white persons representing all geographic localities in the United States.

The data were obtained by periodic interviews (four to six times in one year) with an informant, usually the housewife, who reported her own dental work and that of other members of the household. The informants may have reported their own dental work more completely than that of other members of the household, but the frequency of the interviews with the informant over the year would tend to favor the accuracy and completeness of the reporting. In the CCMC study, the dental services are reported on a yearly basis per thousand persons canvassed in the survey, and they cover the categories shown in Table 2.

METHOD

As indicated earlier, provisional estimates of the yearly incidence of need are derived in the present report by appropriate combination of the data given in the ADA and CCMC reports. The rationale of the combination is as follows: The ADA material indicates how much need exists at a given moment per person of particular age and sex (Table 1); the

TABLE 2.—FREQUENCY OF SERVICES OF SPECIFIED TYPES RENDERED, NUMBER OF SERVICES OF SPECIFIED TYPES RENDERED ANNUALLY PER THOUSAND PERSONS OF SPECIFIED AGE AND ANNUAL INCOME GROUPS*

Age	Socio-Economic Status																				
	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over
	Services Accomplished per Year per Thousand Persons of Specified Age Groups																				
	Fillings			Extractions			Crowns and Bridges			Dentures			Prophylaxes			X-Rays			Orthodontia		
10-14	379.1	689.6	1037.2	170.3	207.5	167.5	3.8	9.8	3.9	0.4	0.9	0.0	52.6	98.4	340.8	4.6	9.8	32.3	4.2	12.5	65.6
15-29	483.7	875.0	1136.0	154.1	173.1	158.8	11.8	28.9	32.0	2.8	5.0	2.6	64.9	101.7	325.7	6.9	19.2	46.9	1.4	4.1	44.6
20-24	320.2	707.7	1011.2	203.2	254.7	245.2	17.2	45.9	74.8	2.8	5.0	2.7	44.1	133.6	272.3	13.4	25.1	71.7	2.8	4.2	9.5
25-34	370.5	694.3	1074.7	418.8	348.9	401.3	35.3	52.6	132.2	10.8	11.5	12.6	51.4	118.1	301.3	24.8	40.5	80.3	1.7	0.7	1.6
35-44	192.0	430.8	937.5	464.1	529.2	364.8	21.5	59.0	127.4	17.4	22.2	13.8	36.3	88.8	287.2	18.9	38.7	86.5	0.7	1.9	2.4
45-64	78.0	240.5	643.2	358.3	413.5	418.9	19.8	44.1	103.1	22.9	45.9	34.0	21.4	57.7	254.8	13.2	30.6	77.9	1.0	1.8	3.5
65 and over	1.9	31.7	228.4	100.0	153.4	317.9	5.7	5.3	26.5	13.2	21.2	53.0	5.7	26.5	99.3	1.9	5.3	26.5	0.0	0.0	3.3

*Among more than 38,000 white persons canvassed by the Committee on the Costs of Medical Care and the United States Public Health Service (Material adapted from the CCMC report, Pub. Health Rep., April 21, 1939, p. 629.)

CCMC values represent the amount of dental service received in a year among another sample of the population. (Table 2.) In the first study, the data represent need that has been accumulated in the mouth, but has not been met. In the second instance, the data represent services received; that is, need that has been satisfied within one year. In technical terms, the ADA data constitute prevalence values, while the CCMC data represent incidence values. Because of that difference in their character, the two sets of rates cannot be combined directly, but they can be put together if the data are adjusted to make the two sets comparable.

For that purpose, the CCMC incidence values are converted into prevalence rates through accumulation of the age-specific incidence values shown in Table 2. The results of that accumulation are given in Table 4. In accomplishing this step, the assumption is made that persons in every age group of the CCMC sample are similarly affected by all those unidentified conditions that may influence diagnosis and treatment of dental need. That is to say, the assumption is made that all conditions that controlled the rate of accumulation of dental services over the lifetime of a person now 60 years of age are quite similar to the conditions controlling the rate of accumulation of dental services in a person now 20 years of age. It is to be recognized that this is a fairly broad assumption, but, because of the impossibility of collecting seriatim information on dental services received over a lifetime of about 60 years for a representative sample of persons, data obtained by indirect analysis and based on such assumption are the only kind available. (It will be recognized that the method and assumptions utilized here are those employed in the computation of the life table by which age-specific death rates are used to calculate values for the cumulative experience with mortality in a given population for the ages from infancy to late adulthood. From such cumulative death rates, values for the expectation of life are computed.)

Conversion of the age specific incidence values for dental service (Table 2) into the cumulative values shown in Table 4 provides rates that will express the accumulated experience of the population with the provision of care in terms of various types of dental service. (The age-specific rates representing volumes of service of each type [as given in Table 2] are multiplied by the number of years included in each age group. The multiplication is begun for the first age group [10-14] and the products of such multiplication of each subsequent age group is added to the accumulation of the multiplications of the preceding age groups. The accumulation is begun at 10 years of age to include findings that may be assumed to apply largely to the permanent teeth. By that procedure, values are obtained [Table 3] that give for each type of dental service the accumulated volume of service received per person over the interval from 10 years of age to the end of each succeeding age group. These values are obtained for each family income group and are plotted against age, and smooth curves are drawn through the plotted points. To obtain data for ages comparable with those of the ADA material, values which give the amount of dental service accumulated up to the midpoints of the age groups are read off the fitted curves. The latter values are those shown in Table 4.) The ADA data and those of the CCMC report are now comparable on the age basis, and since they are both expressed as prevalence rates, they may be combined to derive the accumulated experience with diagnosis for each type of dental need.

The computations by which the age-corresponding ADA and CCMC values are combined are given in Table 5.

The purpose of combining the ADA

TABLE 3.—VOLUME OF SERVICES OF SPECIFIED TYPES RENDERED PER PERSON OF EITHER SEX UP TO SPECIFIED AGES, OF SPECIFIED ANNUAL INCOME GROUPS*

Age	Socio-Economic Status																				
	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over
	Volume of Services Rendered up to the End of the Specified Age Intervals per Person																				
	Fillings			Extractions			Crowns and Bridges			Dentures			Prophylaxes			X-Rays			Orthodontia		
10-14	1.9	3.4	5.2	0.9	1.0	0.8	0.02	0.05	0.02	0.00	0.01	0.00	0.26	0.49	1.70	0.02	0.05	0.16	0.02	0.06	0.33
25-19	4.3	7.8	10.9	1.6	1.9	1.6	0.08	0.19	0.18	0.02	0.03	0.01	0.59	1.00	3.33	0.06	0.15	0.40	0.03	0.08	0.55
20-24	5.9	11.4	15.9	2.6	3.2	2.9	0.16	0.42	0.55	0.03	0.05	0.03	0.81	1.67	4.69	0.12	0.27	0.75	0.04	0.10	0.60
15-34	9.6	18.3	26.7	6.8	6.7	6.9	0.52	0.95	1.88	0.14	0.17	0.15	1.32	2.85	7.71	0.37	0.68	1.56	0.06	0.11	0.61
35-44	11.5	22.6	36.0	11.5	12.0	10.5	0.73	1.54	3.15	0.31	0.39	0.29	1.69	3.74	10.58	0.56	1.06	2.42	0.07	0.13	0.64
45-64	13.1	27.4	48.9	18.6	20.2	18.9	1.13	2.42	5.21	0.77	1.31	0.97	2.11	4.89	15.68	0.83	1.67	3.98	0.09	0.17	0.71
65 and over	13.1	27.7	51.2	19.6	21.8	22.1	1.19	2.47	5.48	0.90	1.52	1.50	2.17	5.16	16.67	0.84	1.73	4.24	0.09	0.17	0.74

*Among more than 38,000 white persons canvassed by the Committee on the Costs of Medical Care and the United States Public Health Service. (Material adapted from the CCMC report). The values shown were obtained by accumulating the rates shown in Table 2 and converting the results of the accumulation into per person rates.

TABLE 4.—VOLUME OF SERVICES OF SPECIFIED TYPES RENDERED PER PERSON OF EITHER SEX AND OF SPECIFIED AGE AND ANNUAL INCOME GROUPS*

Age	Socio-Economic Status																				
	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over	Under $2,000	$2,000-$3,000	$3,000 and Over
	Volume of Services Rendered up to the Midpoints of the Specified Age Intervals; per Person																				
	Fillings			Extractions			Crowns and Bridges			Dentures			Prophylaxes			X-Rays			Orthodontia		
15-19	3.0	5.6	8.0	1.2	1.4	1.2	0.1	0.1	0.1	0.01	0.02	0.00	0.4	0.6	2.4	0.03	0.10	0.28	0.03	0.07	0.45
20-24	5.0	9.6	13.6	2.2	2.4	2.2	0.1	0.2	0.4	0.02	0.04	0.02	0.7	1.5	4.1	0.09	0.20	0.54	0.04	0.08	0.54
25-29	7.0	13.4	18.8	3.7	4.0	3.8	0.3	0.5	0.9	0.06	0.08	0.06	1.0	2.1	5.7	0.17	0.34	0.88	0.04	0.10	0.58
30-34	8.6	16.7	24.0	5.7	5.8	5.4	0.4	0.8	1.5	0.11	0.14	0.12	1.3	2.6	7.3	0.28	0.52	1.28	0.05	0.11	0.62
35-39	10.0	19.5	28.8	7.9	8.0	7.4	0.6	1.1	2.2	0.18	0.22	0.19	1.5	3.1	8.7	0.40	0.74	1.74	0.06	0.13	0.64
40-44	11.1	21.6	33.4	10.3	10.6	9.4	0.7	1.4	2.9	0.27	0.33	0.25	1.7	3.5	10.1	0.52	0.99	2.30	0.07	0.14	0.66
45-49	11.8	23.5	37.8	12.7	13.3	11.6	0.8	1.7	3.5	0.36	0.50	0.36	1.8	3.9	11.5	0.62	1.23	2.84	0.08	0.15	0.68
50-54	12.2	25.1	42.0	14.9	15.7	13.9	0.9	1.9	4.1	0.48	0.73	0.54	2.0	4.2	12.8	0.70	1.41	3.32	0.08	0.16	0.69
55-59	12.5	26.3	45.2	16.6	17.9	16.1	1.0	2.2	4.6	0.59	0.97	0.71	2.1	4.5	14.0	0.76	1.54	3.65	0.09	0.16	0.70
60-64	12.8	27.2	48.0	18.1	19.6	18.1	1.1	2.3	5.0	0.71	1.19	0.88	2.2	4.8	15.0	0.80	1.63	3.89	0.09	0.17	0.71
65-75	13.0	27.6	50.6	19.5	21.3	20.7	1.2	2.5	5.4	0.83	1.41	1.24	2.2	5.1	16.2	0.84	1.71	4.10	0.09	0.17	0.73

*Among more than 38,000 white persons canvassed by the Committee on the Costs of Medical Care and the United States Public Health Service. (Material adapted from the CCMC report and obtained by interpolating from smooth curves fitted to the data of Table 3.)

and the CCMC data by the methods described is measurement of the yearly increment or incidence of experience with diagnosis; in this example, diagnosis of the need for fillings. (Because no data are available on the existing dental needs of persons who were not visiting a dentist at the time of the ADA survey, it is difficult to calculate an existing-need rate for the general population. In this analysis, the assumption is made that the ADA rates represent the existing need among persons of the general population.) Thus, up to 17.5 years of age (the midpoint of the age interval 15-19 years), 5.6 fillings have been placed per person of the income group $2,000-2999. (Col. A, Table 5.) An existing need for 6.6 fillings is found at the same age. (Col. B, Table 5.) Therefore, the total accumulated diagnoses of need for fillings over the lifetime from 10 to 17.5 years of age averages 12.2 fillings. (Col. C, Table 5.) Up to the next five-year age interval (22.5 years of age), a total of 9.6 fillings have been placed per person and, at 22.5 years of age, the need for 7.0 additional fillings is diagnosed. Accordingly, up to 22.5 years of age, the person of the income group under discussion has a total diagnosis of need for 16.6 fillings. With each advancing year, the need for fillings accumulates in the form of fillings actually placed (Col. A, Table 5) and the need for fillings not yet placed. (Col. B, Table 5.) The total of both up to each age is shown by the values in column C of Table 5. The yearly increment of diagnosed need for fillings (shown in column D) is obtained by dividing the changes shown in column C by the group interval of five years of the accumulated values shown in column 6.

TABLE 5.—EXAMPLE OF METHOD USED FOR COMBINING THE DATA OF THE ADA AND THE CCMC REPORTS*

Age	Values for Midpoints of Age Intervals			
	A†	B	C	D
15-19	5.6	6.6	12.2	—
20-24	9.6	7.0	16.6	0.88
25-29	13.4	5.2	18.6	0.40
30-34	16.7	5.2	21.9	0.66
35-39	19.5	4.1	23.6	0.34
40-44	21.6	3.5	25.1	0.30
45-49	23.5	2.4	25.9	0.16
50-54	25.1	2.2	27.3	0.28
55-59	26.3	1.8	28.1	0.16
60-64	27.2	1.3	28.5	0.08
65 and over	27.6	1.1	28.7	0.04

*Material used involves need for fillings among the socio-economic group with annual incomes of $2,000-$3,000.

†A, accumulated CCMC values (services rendered) shown in Table 4; B, ADA values (existing needs) as shown in Table 1; C, accumulated diagnoses; that is, the attained volume of diagnosis per person, obtained by adding together the corresponding age values shown in columns A andB; D, one-year increments of diagnosis of need, obtained from column C.

TABLE 6.—COMPUTATION OF THE ACCUMULATED AND YEARLY VOLUMES OF DIAGNOSIS PER PERSON UP TO THE MIDPOINTS OF THE SPECIFIED AGE GROUPS

Age	Need for Fillings					
	Socio-Economic Status					
	Under $2,000		$2,000-$3,000		$3,000 and Over	
	C*	D	C	D	C	D
15-19	9.6	—	12.2	—	13.7	—
20-24	11.5	0.38	16.6	0.88	18.8	1.02
25-29	12.6	0.22	18.6	0.40	23.6	0.96
30-34	13.7	0.22	21.9	0.66	28.1	0.90
35-39	13.9	0.04	23.6	0.34	32.9	0.96
40-44	14.1	0.04	25.1	0.30	37.2	0.86
45-49	14.2	0.02	25.9	0.16	41.1	0.78
50-54	14.2	0.00	27.3	0.28	44.7	0.72
55-59	14.2	0.00	28.1	0.16	47.8	0.62
60-64	14.2	0.00	28.5	0.08	49.5	0.34
65 nd over	14.8	0.06	28.7	0.02	52.4	0.29

*For description of columns, see footnote to Table 5. Columns B and A, not shown here or in the following tables, can be obtained from Tables 1 and 2, respectively.

FINDINGS

Effect of Socio-Economic Status on Dental Diagnoses Accumulated over an Elapsed Lifetime.—The full results of the combination of the ADA and CCMC data are shown in Tables 6, 7, 8, 9 and 10. The values shown in the columns C give the amount of diagnosis experienced on the average up to the time particular ages are reached by persons of particular socio-economic class.

TABLE 7.—COMPUTATION OF THE ACCUMULATED AND YEARLY VOLUMES OF DIAGNOSIS PER PERSON UP TO THE MIDPOINTS OF THE SPECIFIED AGE GROUPS

Age	Need for Extraction					
	Socio-Economic Status					
	Under $2,000		$2,000-$3,000		$3,000 and and Over	
	C*	D	C	D	C	D
15-19	2.4	—	2.1	—	1.6	—
20-24	3.6	0.24	3.6	0.30	3.2	0.32
25-29	5.4	0.36	5.1	0.30	4.6	0.28
30-34	8.1	0.54	7.2	0.42	6.3	0.34
35-39	10.9	0.56	9.7	0.50	8.7	0.48
40-44	14.4	0.70	12.2	0.50	11.0	0.46
45-49	18.4	0.80	16.9	0.94	13.6	0.52
50-54	19.5	0.22	19.2	0.46	15.6	0.40
55-59	21.6	0.42	21.6	0.48	18.6	0.60
60-64	23.0	0.28	23.0	0.28	20.0	0.28
65 and over	24.0	0.10	23.0	0.00	22.4	0.24

*For description of the columns, see footnote to Tables 5 and 6.

TABLE 8.—COMPUTATION OF THE ACCUMULATED AND YEARLY VOLUMES OF DIAGNOSIS PER PERSON UP TO THE MIDPOINTS OF THE SPECIFIED AGE GROUPS

Age	Need for Crowns and Bridges					
	Socio-Economic Status					
	Under $2,000		$2,000-$3,000		$3,000 and and Over	
	C*	D	C	D	C	D
15-19	0.55	—	0.40	—	0.30	—
20-24	0.71	0.032	0.84	0.088	0.77	0.094
25-29	0.85	0.028	1.07	0.046	1.27	0.100
30-34	1.00	0.030	1.50	0.086	2.12	0.170
35-39	1.15	0.030	1.80	0.060	3.02	0.180
40-44	1.27	0.024	1.98	0.036	3.57	0.110
45-49	1.27	0.000	2.35	0.074	4.12	0.110
50-54	1.37	0.020	2.42	0.014	4.68	0.112
55-59	1.37	0.000	2.65	0.046	5.37	0.138
60-64	1.44	0.014	2.72	0.014	5.37	0.000
65 and over	1.44	0.000	2.72	0.000	5.94	0.057

*For description of columns, see footnote to Tables 5 and 6.

For fillings: A person of the lowest economic group accumulates over a lifetime (from 15 years to 65 and over) diagnosed need amounting to about fifteen fillings. A person of the middle income group accumulates, over the same span, a diagnosed need for twenty-eight fillings, while a person in the highest income group accumulates over the same interval a total diagnosed need for more than fifty-two fillings. (Fig. 1.)

(It is necessary to indicate that teeth which are carious and therefore determined to require fillings may not be filled. That is, the recommendation of the dentist may not be followed by the patient. Thus, when a filling is recommended, the patient may insist, for a variety of reasons, on having the teeth extracted. This factor must be considered in the interpretation of the low experience of the low income groups with fillings. Hence, in the cases wherein many teeth have been extracted when they should have been filled, the dentist cannot make a diagnosis of need for fillings, but must diagnose need for dentures or crowns and bridges.)

For extractions: The lowest economic group shows at practically every age the largest experience with diagnosis. (Fig. 2.) Over the adult age range, therefore, a person of the lowest economic group has had diagnosed a need for extraction involving twenty-four teeth, while a person of the highest economic group, over

the same interval of time, has accumulated diagnoses involving fewer than twenty-three teeth. In a recent publication, referred to earlier in the present paper,[8] it was shown that those differences in the rate of survival of the teeth result in the finding that the permanent teeth of the well-to-do render, on the average, a service about 130 tooth years longer, per person, than the teeth of a person in the lowest economic group render.

Marked differences also appear in the need for crowns and bridges diagnosed for the different socio-economic groups. Over the adult lifetime, a person of the income group under $2,000 has a diagnosed need for 1.4 crowns and bridges; a person of the income group $2,000-$3,000 for 2.7; while a person of the income group $3,000 and over has an accumulated diagnosed need for nearly six crowns and bridges.

As might be expected, because of the tendency of the teeth of the well-to-do to survive longer, the experience with diagnoses of need for dentures is lowest for the highest economic group. However, a person of the lowest income group when reaching 65 years of age shows, on the average, an attained volume of diagnosed need for about two dentures, whereas a person of the highest income class shows an accumulated diagnosed need for approximately the same number. (Fig. 4.)

From the material presented, it is clear that the volume of dental service dispensed over a lifetime is markedly influenced by socio-economic status. It is also clear that the volume of diagnosis is perhaps even more profoundly influenced. This is especially true of prophylaxes. (Fig. 5.)

TABLE 9.—COMPUTATION OF THE ACCUMULATED AND YEARLY VOLUMES OF DIAGNOSIS PER PERSON UP TO THE MIDPOINTS OF THE SPECIFIED AGE GROUPS

Age	Need for Dentures					
	Socio-Economic Status					
	Under $2,000		$2,000-$3,000		$3,000 and and Over	
	C*	D	C	D	C	D
15-19	0.11	—	0.02	—	0.00	—
20-24	0.12	0.002	0.24	0.044	0.02	0.004
25-29	0.26	0.028	0.24	0.000	0.16	0.028
30-34	0.41	0.030	0.40	0.032	0.32	0.032
35-39	0.68	0.054	0.58	0.036	0.39	0.014
40-44	0.97	0.058	0.89	0.062	0.55	0.032
45-49	1.26	0.058	1.26	0.074	0.76	0.042
50-54	1.48	0.044	1.59	0.066	1.04	0.056
55-59	1.59	0.022	1.93	0.068	1.41	0.074
60-64	1.91	0.064	2.15	0.044	1.68	0.054
65 and over	2.03	0.012	2.47	0.032	1.94	0.026

*For description of columns, see footnote to Tables 5 and 6.

TABLE 10.—COMPUTATION OF THE ACCUMULATED AND YEARLY VOLUMES OF DIAGNOSIS PER PERSON UP TO THE MIDPOINTS OF THE SPECIFIED AGE GROUPS

Age	Need for Prophylaxes					
	Socio-Economic Status					
	Under $2,000		$2,000-$3,000		$3,000 and and Over	
	C*	D	C	D	C	D
15-19	1.2	—	1.4	—	3.1	—
20-24	1.5	0.06	2.3	0.18	4.9	0.36
25-29	1.8	0.06	2.9	0.12	6.4	0.30
30-34	2.0	0.04	3.2	0.06	8.1	0.34
35-39	2.1	0.02	3.8	0.12	9.5	0.28
40-44	2.3	0.04	4.2	0.08	10.8	0.26
45-49	2.3	0.00	4.5	0.06	12.2	0.28
50-54	2.5	0.04	4.8	0.06	13.4	0.24
55-59	2.6	0.02	5.1	0.06	14.7	0.26
60-64	2.7	0.02	5.3	0.04	15.5	0.16
65 and over	2.7	0.00	5.4	0.01	16.8	0.13

*For description of the columns, see footnote to Tables 5 and 6.

8. Klein, Henry: Tooth Mortality and Socio-Economic Status—Life Tables for Teeth. J.A.D.A., 30:80, January 1, 1943.

Effect of Socio-Economic Status on the Frequency of Dental Diagnosis.—The age-specific yearly rates of diagnosis, for particular kinds of dental need, in persons of particular socio-economic groups are represented by the annual increments of diagnosis shown in columns D in Tables 6, 7, 8, 9 and 10.

The average yearly rate at which needs are diagnosed varies significantly with socio-economic status. For example, the need for fillings is diagnosed at the rate of about one-tenth of a filling per year over the adult life span of a person in the under $2,000 group, while the need is diagnosed at a rate nearly eight times as high (0.79) over the lifetime of a person in the $3,000 and over group. The diagnosis of need for extraction is approximately 0.43 teeth per year per person of the lowest economic group, while the rate is somewhat lower (0.39) per year per person for the $3,000 and over group.

The yearly rate over a lifetime for diagnosis of need for crowns and bridges is 0.02 per person of the under $2,000 group, and more than five times as high (0.11) per person of the $3,000 and over group. The need for dentures is diagnosed at about the same rate in high and low economic groups. The latter finding probably reflects the fact that the socio-economic conditions do not interfere too seriously with the diagnosis of need for artificial dentures.

The effect of economic status on the rate at which needs are diagnosed is perhaps most pointedly shown for prophylaxes. Here, the rate of diagnosis of need is found to be 0.03 per year per person of the lowest economic group, and for persons of the highest group the need is diagnosed at a yearly rate more than

TABLE 11.—AVERAGE AND AGGREGATE YEARLY VOLUMES OF NEED FOR FILLINGS DIAGNOSED FOR ALL AGES AND SOCIO-ECONOMIC COMPONENTS OF THE WHITE ADULT POPULATION

Socio-Economic Status	Need for Fillings All Ages
Under $2,000	
X*	0.13
Y	60.57
Z	7.78
$2,000-$3,000	
X	0.39
Y	10.52
Z	4.06
$3,000 and over	
X	0.79
Y	6.31
Z	4.99
All incomes	
X	0.22
Y	77.40
Z	16.83

*X, average yearly increment of diagnosis of need for fillings (per person) derived from columns D, Table 6. Y, number of white adults (in millions) in particular socio-economic groups. Z, aggregate yearly volume of diagnosis in millions of fillings.

TABLE 12.—AVERAGE AND AGGREGATE YEARLY VOLUMES OF NEED FOR EXTRACTION DIAGNOSED FOR ALL AGES AND SOCIO-ECONOMIC COMPONENTS OF THE WHITE ADULT POPULATION

Socio-Economic Status	Need for Extraction All Ages
Under $2,000	
X*	0.43
Y	60.57
Z	25.98
$2,000-$3,000	
X	0.44
Y	10.52
Z	4.54
$3,000 and over	
X	0.39
Y	6.31
Z	2.48
All incomes	
X	0.43
Y	77.40
Z	33.00

*X, average yearly increments of diagnosis of need for extraction (per person) derived from columns marked D, Table 7. Y, number of white adults (in millions) in socio-economic groups. Z, aggregate yearly volume of diagnosis in millions of extractions.

nine times as high (0.29 per person per year). (It is of interest to point out that these rates would support the view that persons of the lowest income group have a diagnosed need for prophylaxis once every thirty-three years, while a person of the highest income group [$3,000 and over]' has a diagnosed need for prophylaxis about once every three and one-half years. Dental consensus recommends at least one per year.)

TABLE 13.—AVERAGE AND AGGREGATE YEARLY VOLUMES OF NEED FOR CROWNS AND BRIDGES DIAGNOSED FOR ALL AGES AND SOCIO-ECONOMIC COMPONENTS OF THE WHITE ADULT POPULATION.

Need for Crowns and Bridges	
Socio-Economic Status	All Ages
Under $2,000	
X*	0.020
Y	60.57
Z	1.238
$2,000-$3,000	
X	0.052
Y	10.52
Z	0.551
$3,000 and over	
X	0.113
Y	6.31
Z	0.713
All incomes	
X	0.032
Y	77.40
Z	2.502

*X, average yearly increments of diagnosis of need for crowns and bridges (per person) derived from columns marked D, Table 8, Y, number of white adults (in millions) in socio-economic groups. Z, aggregate yearly volume of diagnosis in millions of crowns and bridges.

TABLE 14.—AVERAGE AND AGGREGATE YEARLY VOLUMES OF NEED FOR DENTURES DIAGNOSED FOR ALL AGES AND SOCIO-ECONOMIC COMPONENTS OF THE WHITE ADULT POPULATION

Need for Dentures	
Socio-Economic Status	All Ages
Under $2,000	
X*	0.035
Y	60.57
Z	2.095
$2,000-$3,000	
X	0.043
Y	10.52
Z	0.456
$3,000 and over	
X	0.033
Y	6.31
Z	0.207
All incomes	
X	0.036
Y	77.40
Z	2.758

*X, average yearly increments of diagnosis of need for dentures (per person) derived from columns marked D, Table 9. Y, number of white adults (in millions) in socio-economic groups. Z, aggregate yearly volume of diagnosis in millions of dentures.

The Frequency of Diagnosis in Case of the Average White Adult.—It has been shown in preceding sections that the kinds and rates of diagnosis of need are affected by the socio-economic factors. The lower the economic level, the less frequent the diagnosis. Since the majority of the population falls in the lower economic classes, it might be expected that the annual rates of diagnosis for the whole white adult population would tend to approximate these rates by which the lower economic groups are characterized.

The findings and discussion given previously aid in understanding the casual and incidental factors in frequency of diagnosis. From a practical public health point of view, it is of interest to attempt to estimate the annual rate of diagnosis now attained by the adults as a whole. Such information makes possible some prediction of the load of need and the volume of demand which require servicing within any year for the population as it is now constituted and as its dental need is now diagnosed by the dentists of the country.

The annual frequency of diagnosis of particular kinds of dental need per white person of given age is shown by the values in the X columns of the all-income sections of Tables 11-15.

For fillings: The annual rate of diagnosis consistently decreases with advancing age. Thus, a white person 20-24 years of age has a need of 0.5 of a filling diagnosed annually; between the ages of 25 and 29, a person has a need of 0.3 of a filling diagnosed per year, and a person in the age group 50-54 has the need for fillings diagnosed at the rate of 0.11 per year. Over all the adult ages, the need for fillings is diagnosed at the rate of approximately 0.22 fillings per person per year. (Table 11.) (The decrease in the rate each year with increasing age does not necessarily indicate that caries susceptibility is decreasing. With advancing age, fewer teeth remain in the mouth, and hence fewer areas are available to be attacked by caries.)

TABLE 15.—AVERAGE AND AGGREGATE YEARLY VOLUMES OF NEED FOR PROPHYLAXIS DIAGNOSED FOR ALL AGES AND SOCIO-ECONOMIC COMPONENTS OF THE WHITE ADULT POPULATION

Socio-Economic Status	Need for Prophylaxis: All Ages
Under $2,000	
X*	0.03
Y	60.57
Z	2.04
$2,000-$3,000	
X	0.09
Y	10.52
Z	0.96
$3,000 and over	
X	0.27
Y	6.31
Z	1.73
All incomes	
X	0.06
Y	77.40
Z	4.73

*X, average yearly increments of diagnosis of need for prophylaxis (per person) derived from columns marked D, Table 10. Y, number of white adults (in millions) in socio-economic groups. Z, aggregate yearly volume of diagnosis in millions of prophylaxis.

For tooth extractions: The frequency of diagnosis is shown by Table 12. By appropriate weighting of the values in Table 7, it can be shown that the yearly rate of diagnosis increases from 0.25 per person per year in the age group 20-24 to a peak of 0.79 per person per year within the interval 45-49 years. The annual rate of diagnosis (for extractions) then decreases, reaching 0.10 per year per person for the age group 65 years and over. Over the adult age range, the need is diagnosed at the rate of 0.43 teeth requiring extraction per person per year.

For crowns and bridges, the annual rate of diagnosis increases gradually for a person of any income group beginning at about 20 years of age and reaching a maximum for the age group 30-34 years. (Table 8.) The rate then decreases, reaching a minimum for persons in the age group 65 years and over. For all adult ages, the need for crowns and bridges is diagnosed at the rate of 0.032 crowns and bridges per year per person. (Table 13.)

For dentures: The annual rates of diagnosis are obtained from Table 9 by appropriate computation. Among 1,000 persons aged 20-24 years, the need for dentures is diagnosed, within a year, for seven persons; among 1,000 persons aged 45-49 years, within a year, the need for dentures is diagnosed for fifty-nine persons. Over the adult years, the need is diagnosed at the rate of forty dentures per year per thousand persons. (Table 14.)

For prophylaxis: The annual rates of diagnosis are shown by the data given in the all-income section of Table 15, row X. The yearly diagnosis rate for prophylaxes fluctuates from high to low and vice versa over the adult age range. In the main, the annual rates for that need are higher in the younger adult ages. Over all ages, the need is diagnosed at the rate of 0.06 prophylaxes per year per person.

(This is equivalent to the diagnosis of need for prophylaxis at about one prophylaxis every 16 years per person.)

The Aggregate Yearly Volume of Need Diagnosed in the Entire White Adult Population.—The aggregate annual volume of diagnosis for each category of need may be estimated by applying the yearly per person rates for particular age and income groups to the number of white persons of the population included in those age and income classes. The computations carried out for that purpose are shown in Tables 11-15 in the Z columns. These computations indicate that the adult white population 20 years of age and over has an annual volume of diagnosis which involves need for nearly 17,000,000 fillings, 33,000,000 extractions, 2,500,000 crowns and bridges, 2,800,000 dentures and 4,700,000 prophylaxes.

The Aggregate Yearly Volume of Service Received by the Entire White Adult Population.—By applying the frequency rates for dental service given by Collins[5] and shown in Table 2 to the number of persons included in the various age and socio-economic components of the white adult population, it is possible to estimate the yearly volumes of service accomplished for particular age groups of the population, as well as for an average person of the white adult population. Those computations are shown in Table 16. The data presented in that table reveal that annually the 77,400,000 white persons between the ages of 20 and 65 years of age and over receive approximately 22,000,000 fillings, 27,000,000 extractions, 2,500,000 crowns and bridges, 1,300,000 dentures and 4,700,000 prophylaxes. As shown in the preceding section (Tables 11-15), the needs of that population are diagnosed at the annual volume of 16,800,000 fillings, 33,000,000 extractions, 2,500,000 crowns and bridges, 2,700,000 dentures and 4,700,000 prophylaxes. It follows, therefore, that only in the case of fillings do the aggregate services received annually among adults exceed in total volume the new need diagnosed annually. Earlier, it was shown that even though the services (by fillings) exceed annually the need for fillings newly diagnosed over the adult ages, this differential never

TABLE 16.—AVERAGE YEARLY VOLUME OF DENTAL SERVICE RENDERED (PER WHITE ADULT) AND AGGREGATE VOLUME RENDERED FOR WHITE ADULT POPULATION ANNUALLY

Age	Number of White Adult Persons in U.S. (Millions)	Kinds of Service										
		Fillings	Extractions	Crowns and Bridges	Dentures	Prophylaxes	Fillings	Extractions	Crowns and Bridges	Dentures	Prophylaxes	Total Services
		Received Annually per Person of White Adult Population, All Incomes					Services Estimated as Rendered Annually for Adult White Population, All Incomes (Millions)					
20-24	11.18	0.420	0.213	0.025	0.003	0.072	4.70	2.38	0.28	0.03	0.81	8.20
25-34	19.41	0.466	0.408	0.045	0.011	0.079	9.04	7.92	0.87	0.21	1.53	19.57
35-44	17.74	0.288	0.466	0.036	0.018	0.065	5.11	8.26	0.63	0.32	1.14	15.46
45-64	22.12	0.155	0.372	0.031	0.027	0.049	3.42	8.22	0.69	0.60	1.08	14.01
65 and over	6.95	0.022	0.122	0.007	0.017	0.015	0.16	0.85	0.05	0.12	0.11	1.29
All ages	77.40	0.290	0.357	0.033	0.017	0.060	22.43	27.63	2.52	1.28	4.67	58.53

succeeds in completely eliminating existing need for fillings, because the average white person enters adult life with an accumulation of untreated need for fillings which is so large that the favorable differential in service over the adult ages does not succeed in entirely eliminating the effects of the original accumulation at the time adulthood is reached.

For all other types of need, the annual volume of diagnosis of new need is larger than the annual volume of services rendered.

Estimate of the "True" Annual Volume of Dental Need of the Adult White Population.—The material given previously indicates that dental services recommended by a dentist are more frequently sought among the higher economic groups than among persons of low income. Because of that fact, the total volume of need diagnosed for the whole adult white population, as estimated earlier, may be assumed to be lower than that total which could be determined if all persons, irrespective of socio-economic status, were to have a diagnosis as frequently.

It may, on the basis of the following considerations, be postulated readily that the rate at which dental need arises is not significantly influenced by socio-economic status: In earlier studies,[9, 10] it was shown that the socio-economic status does not affect the tendency to be attacked by dental caries. It is further

TABLE 17.—AVERAGE VOLUME OF DENTAL SERVICE RENDERED PER PERSON PER YEAR IN SOCIO-ECONOMIC GROUP $5,000 AND OVER; ESTIMATES OF AGGREGATE VOLUME OF SERVICE NEEDED ANNUALLY BY ADULT WHITE POPULATION OF SPECIFIED AGE GROUPS

Age	Number of White Adult Persons in U.S. (Millions)	Kinds of Services										
		Fillings	Extractions	Crowns and Bridges	Dentures	Prophylaxes	Fillings	Extractions	Crowns and Bridges	Dentures	Prophylaxes	Total Services
		Received Annually per Person of Income Group $5,000 and Over, CCMC Population					Services Estimated as Needed Annually for White Adult Population* (Millions)					
20-24	11.18	1.242	0.196	0.064	0.004	0.370	13.89	2.19	0.72	0.04	4.14	20.98
25-34	19.41	1.216	0.394	0.144	0.011	0.390	23.60	7.65	2.80	0.21	7.57	41.83
35-44	17.74	1.139	0.331	0.157	0.006	0.413	20.21	5.87	2.79	0.11	7.33	36.31
45-64	22.12	0.869	0.384	0.136	0.039	0.363	19.22	8.49	3.01	0.86	8.03	39.61
65 and over	6.95	0.377	0.173	0.031	0.056	0.136	2.62	1.20	0.22	0.39	0.95	5.38
All ages	77.40	1.028	0.328	0.123	0.021	0.362	79.54	25.40	9.54	1.61	28.02	144.11

*Aggregate need: that which is serviced and that which remains unserviced. When the values shown in Table 16 are subtracted from the corresponding values given here in Table 17, the results represent the aggregate volume of need which remains unmet each year. It is these untreated aggregates that accumulate each year and present the tremendously high volumes of accumulated unserviced needs that now characterize the population.

9. Klein, Henry, and Palmer, C. E.: Medical Evaluation of Nutritional Status. X. Susceptibility to Dental Caries and Family Income. Milbank Mem. Fund Quart., 20:169, April 1942.

10. Klein, Henry, and Palmer, C. E.: Community Economic Status and Dental Problem of School Children. Pub. Health Rep., 55: 187, February 2, 1940.

assumed here that persons of low economic status have at least as great a tendency to be attacked by pyorrhea as persons on high economic levels. Since dental needs, in the main, arise from caries and pyorrhea, the rate at which the need arises from these two pathoses should be at least as high for the poorer elements as it is for the well-to-do.

The material given in the present report indicates clearly that the socio-economic status affects the volume and frequency of diagnosis. The reasons for that effect have been briefly considered earlier. It appears that the effect does not stem from a difference in biologic vulnerability to dental disease, but from more extrinsic conditions such as the frequency of visits to a dentist and the patient's response to the recommendation of the dentist. Since there exists no apparent or impelling reason for believing that the poor have less tendency to develop dental need than the well-to-do, and since the well-to-do probably do not receive any more dental service than they need, the kinds and frequency of diagnosis possible to the adult white population might be at least consonant with the kind and frequency of service now received by persons in the higher socio-economic levels.

The annual volumes of service received, on the average, by persons of particular ages in the income group $5,000 and over are given in Table 17. The data in that table when studied with those that can be derived from Table 6 for the combined income group show, for example, that a person of the income group $5,000 and over of the age group 20-24 years receives 1.24 fillings per year, whereas a person of the general adult white population of that age group has his need for fillings diagnosed (serviced plus unserviced need) at the rate of 0.5 fillings per year. Over the whole adult age range, a person of the income group $5,000 and over receives 1.03 fillings per year (Table 17), whereas, on the average, a white adult (all income groups) has the need for fillings diagnosed (those placed plus those recommended) at the rate of 0.22 fillings per year (Table 11, column X, all incomes). Thus, the rate of diagnosis of need for fillings among the population of white adults is approximately one-fifth the annual rate at which fillings are actually placed in the mouths of persons of the income group $5,000 and over.

For nearly all kinds of need, the well-to-do person receives service at a higher rate of frequency than the rate of diagnosis in the case of the average white person. For example, the number of crowns and bridges placed annually per person of the high income group (0.12) is nearly four times the rate of diagnosis (0.032) (Table 13) of the case in the average white adult, and the annual rate of prophylaxis received by high income groups (0.36) is six times the need diagnosed for the average white adult (0.06). (Table 15.) On the other hand, for a less desirable type of service, for example extractions, the well-to-do have fewer per year (0.33) than are diagnosed, on the average, for a white adult (0.43). (Table 12.)

The annual rates of service received per person in the income group $5,000 and over, when applied to the various age components of the white population of 77,400,000 adults (ages 20-65 years and over), provide estimates of the true annual aggregate volume of need for dental service in the white adult population. (Table 17.) From that material, it may be noted that if all elements of the adult white population had the same kind and frequency of service as do persons of the income group $5,000 and over, the approximately 77,400,000 white adults would require, in any given year, nearly 80,000,000 fillings, 25,000,000 extractions, about 10,000,000 crowns and bridges, approximately 1,500,000 dentures and about 28,000,000 prophylaxes.

From earlier discussion in the present

report, it is clear that the needs that are diagnosed and the services that are received annually by the adult white population differ in volume, kind and frequency from those of persons included in the income group $5,000 and over. These several findings indicate, therefore, that the needs now diagnosed and the services now rendered within any given year for the adult white population are considerably less than those which could be diagnosed, and probably of different kind and order. Hence, instead of the 80,000,000 fillings estimated as the potential yearly crop of need, less than 17,000,000 are newly diagnosed each year and fewer than 23,000,000 are placed each year. (The excess differential in the number placed has been commented on.)

With regard to extractions, as might be expected, more are diagnosed and more are carried out annually than is perhaps necessary for the average white adult. For example, if all elements of the population were to receive the same kind and frequency of diagnosis and service as obtained by the income group $5,000 and over, and assuming that the susceptibility to dental diseases of low income groups is at least as high as that of the more affluent groups, it may be estimated that annually the white adult population would require fewer than 25,000,000 extractions. Instead, the need for more than 33,000,000 is diagnosed and about 27,000,000 are performed.

Again, instead of the estimated potential annual need for nearly 10,000,000 crowns and bridges in the white adults, it is found that a need for fewer than 3,000,000 is diagnosed and less than 2,600,000 are placed. In connection with dentures, it is estimated that the potential annual need involves nearly 3,000,000 prostheses, yet a need for less than 2,000,000 is diagnosed and fewer than 1,300,000 are placed. With regard to prophylaxes, of the 28,000,000 estimated as the potential diagnosis of the annual need, a need for 2,700,000 is diagnosed and only 4,600,000 are given.

In total: Instead of the potential minimum of about 144,000,000 dental services of various types estimated to be required annually by the adult white population, under present circumstances the need for less than 60,000,000 services is diagnosed each year, and fewer than 59,000,000 services are received each year.

These computations and estimates serve to direct attention to the whole mosaic of factors in the diagnosis and servicing of dental need. Among these are manpower and material; for, to meet the actual accumulated unserviced need, and the potential yearly volume of demand which will grow out of the appreciation of the true need arising each year, the resources of dentists, other personnel and supplies to implement their work are now clearly, in terms of the estimates given here, wholly inadequate in the United States.[11-12]

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11. Klein, Henry: Dental Need versus Dental Manpower. J.A.D.A., 31:263, March 1, 1944.

12. Klein, Henry: Civilian Dentistry in War-Time. J.A.D.A., 31:648, May 1, 1944.

FURTHER TESTIMONY IN HEARINGS ON NAVAL DENTAL BILL

STATEMENT OF HON. PHILIP A. TRAYNOR, PRESIDENT, DELAWARE STATE BOARD OF DENTAL EXAMINERS

The CHAIRMAN. Members of the committee, I am going to ask our former colleague in Congress, Dr. Traynor, of Delaware, who is president of the Delaware State Board of Dental Examiners, to make a statement. It is a great pleasure to have you with us, Dr. Traynor.

Dr. TRAYNOR. It was a pleasure to serve with you and it will be a pleasure when I come back.

The CHAIRMAN. Dr. Traynor, what is your comment with reference to this bill?

Dr. TRAYNOR. Mr. Chairman, I am very much in favor of this bill, and I think there are a great many good points in it which will add to the efficiency of dentistry in the Navy.

I have been a Congressman and I have been a dentist for some forty-nine years.

Mr. SASSCER. Which do you find the most difficult?

Dr. TRAYNOR. As a dentist I gained weight; as a Congressman I lost 10 pounds.

Mr. HARRIS. I wish you would give me your formula.

The CHAIRMAN. Go right ahead, Doctor.

Dr. TRAYNOR. As I said, I am a dentist and I have been a Congressman, and I could be a United States Senator if my people wanted me to be.

We have a dentist over there who is doing a very good job, and I believe there are dentist governors of states in the United States.

I myself graduated from dental school in 1895. I have a brother who graduated from medicine in 1900. We never were quarreling about the different professions. I think that dentistry is a separate profession. We have great regard for medicine; the medical man is with us when we are born and he is with us when we leave this earth, if we leave it in natural course. I have no fight with medicine and I regard medicine as a noble profession, but I think that dentistry should be able to be in command and have its own department in the Navy.

The CHAIRMAN. You regard it as fully qualified?

Dr. TRAYNOR. It is qualified.

The CHAIRMAN. Doctor, we are pleased to see you here. I want to say this, that the Good Book says "There is a time for everything," and this seems to have been the psychological time to take up legislation of this kind.

Dr. TRAYNOR. I want to straighten out one point. I introduced a bill in the Seventy-Seventh Congress and that was done on my own initiative; the American Dental Association did not know that I had introduced the bill until I notified them, so they are not behind everything, and there can be bills passed if they are to accomplish a good purpose and they have good backing.

The CHAIRMAN. It is now a quarter to one and the committee will take a recess until 10 o'clock tomorrow.

(At 12:45 p.m., an adjournment was taken to Friday, June 2, 1944, at 10 a.m.)

HOUSE OF REPRESENTATIVES,
COMMITTEE ON NAVAL AFFAIRS,
Friday, June 2, 1944.

The committee met at 10 a.m., Hon. Carl Vinson (chairman) presiding.

The CHAIRMAN. Let the committee come to order for the continuation of consideration of H. R. 4216.

Admiral McIntire, the committee will be glad to have you make any statement you desire with reference to this proposed bill.

STATEMENT OF VICE ADMIRAL ROSS T. McINTIRE, SURGEON GENERAL, UNITED STATES NAVY

Admiral McINTIRE. Mr. Chairman, I think I should start out today by putting in the record as I look over the Members here at the present time, that I do not think it is necessary, really, for me to say what I am going to, because you are all very familiar with Navy procedures. But since the hearing of yesterday was taken up by some of my very good friends—and I mean that—you must have the most distorted and confused idea of the way the Medical Department conducts dental affairs of anything possible. In fact, I have a feeling I should not be Surgeon General of the Navy if such a thing is true. However, on the other side of the thing, we really do have a very efficient and well working Dental Division that is made up of the Dental Corps of the Navy, plus all of the various services that go along with it, and I will be very glad to have any one of you, as many of you have, to walk into any dental set-up in the United States Navy, I do not care where you go, even down in Charleston——

Mr. RIVERS. Thank you.

Admiral McINTIRE. And you will find things working awfully well.

Now, there have been many times in this past year when we have had to take over a different sort of physical requirement following Selective Service providing us with personnel.

Mr. RIVERS. I would like to say I have

never had a chance to get any of your professional help on any of my teeth. I am not permitted to.

Admiral MCINTIRE. That is wrong. We will see that you get it.

Mr. MOTT. Is that the reason you introduced this bill?

Admiral MCINTIRE. We have had, of course, to do a great deal of improvising to do the work that was thrown on us, due to the lower dental standards; so there has been on some stations considerable crowding until new construction could be provided. But, notwithstanding that, I will still say you will find nothing better in the way of dental equipment and organization than you will find right straight through the service.

Now, I want to go to the next point and that is—How do we really operate. The Bureau of Medicine and Surgery has a number of departments or has, we will say, a number of divisions, and those divisions are headed up by competent men. In fact, if those divisions were not headed up by competent men, the Medical Department and the medical service of the Navy would be a mess. Well, it is not. It has a record in this war that will stand a long time. And the head of the Dental Division is a competent individual, and I can tell you that in the years I have been Surgeon General it has not been necessary for me to reverse the Chief of the Dental Division on matters of policy, or handling personnel, at any time. In fact, I trust his judgment as to what the dental policies will be. And that is the way I run my whole department. If I have a key man who cannot swing his load, then I get a new key man; because this is not a one-man show by any means. Also, if it may be of interest to you, I am at any or all times of the day open to the heads of divisions. There is an hour of the morning that every head knows he has access to the Surgeon General; he knows he has the same thing at the end of the day. So we operate that way, and there is never any cut-off—not the slightest—nor is there any cut-off to the Assistant Chief of Bureau.

All right. You heard something about Bethesda yesterday. Well I am quite proud of Bethesda; in fact, I had a lot to do with it—in fact, I had more than that, and I still have more than that. Now Bethesda operates just as any naval hospital operates, except it has a larger set-up. A naval hospital has a medical officer in command and an executive officer. I want you to remember the executive officer's side of this thing. And in the naval hospital there are major departments and dentistry is one of the major departments, and so the head of that department functions just the same as the commanding officer of the Naval Dental School functions at Bethesda. He operates through the commanding officer of the Navy Medical Center. The head of the dental department of the naval hospital at San Diego, which is a tremendous affair, operates directly through the commanding officer of the hospital. There is no difference. We have no irregularities; our administrative control is the same from the bottom up and the top down.

Now when you go into the field, we do find a different situation and there is one place where I think it would not make a great deal of difference whether we operate under a head of a dentistry department, or a head of a dental division, and that is on a naval training station. But when we come to the administrative side of this plan, we are faced with reorganization and change in handling personnel on board combatant ships, and in the field with the Marines. And when you do something that upsets your personnel—I am not talking about the commissioned personnel particularly; I am talking mainly about the enlisted personnel. I want to stop right here and say that the Hospital Corps of the Navy rates every praise we can give it. It is performing one of the finest services that any body of men can possibly perform and you will find out, as this war goes on, what these men have done. It will just make you feel that here is something in performance well beyond the average call of duty.

Now these men are the men who do the work on these combatant ships under their officers. The same thing is done in the field. Now if we are going to separate—and we must separate—the Medical Department and the Dental Department, and you do that on the combatant ship, the Hospital Corps men transfer from the Medical Department to the Dental Department; they are no longer Hospital Corps men; they are dental technicians. And I will tell you in a few minutes how many there are today. We have not been niggardly at all in providing dental technicians. In fact, you will be surprised at the number we have today who do nothing but that—over 7,500. But you separate that service—I have spent two weeks on one of the newest of our big ships, and I saw the ship in action and saw its medical organization, its battle organization. I am going to see, if I can, that the medical organization on all of these ships stays up to the maximum of strength and efficiency—when I take away and set aside a part of those enlisted men—I am not talking about officers—I have done something to the efficiency of that tremendous ship. Because you cannot cover that kind of an organization with a few men. And then I run into trouble immediately, because I say to the Bureau of Personnel first "I want my personnel increased" and remember these are fighting ships. And when I ask to put more men on, they say "Wait a minute; your complement is so and so." You cannot increase your number.

Now the dental section of the medical department on those ships is a well-integrated and functioning outfit. I had the pleasure of seeing a young dental officer conduct his weekly conference in a manner that would please any one. He handled it as well as

any medical officer I have ever seen. Those men fit in; they know anesthesia; they have been taught it; they know advanced first aid. They fit right into the battle organization. If we have to upset it, we will upset it, but we are gambling on efficiency. I want you to give serious thought to what happens when we make such sweeping changes. These are some of the things that will happen, and there is no getting around that point.

The same thing will happen with our Marines. Yes; we can do it all right and I have had many headaches handed to me before. We will work them out, but I want this committee to see some of the hurdles we will have to take if we do this.

Let us look at one other point, and this will be brought out a little bit more, because we have here one of the former commanding officers of one of the best fighting ships we ever had, and he knows more of actual combat than anyone I know of. But, now, let us look at the money side of this thing. That is where I have to come into the picture time and time again, and I can tell you that since 1939 we have been right in the business of putting the Dental Department in fine shape, from the standpoint of matériel, and we have done a good job, with the assistance I have had from Admiral Melhorn's section of the Matériel Division. Those men are experts; they have done a fine job, and they are the men I have leaned on to give me the advice that was necessary to put this outfit in fine shape. Now when we set up this new plan, we must then set up a separate Matériel Section. The Director of this Dental Department will be responsible, and I do not propose to allow any man to be responsible for something when he cannot assume responsibility. So in setting it up, if he has to do this, then he must be responsible; so he must have his own Matériel Section, he must have his own Finance Section. And I do not have to tell you what that means. It won't run into many millions of dollars; it may run into only a few hundred thousand; but where you are going to get your personnel right now would be a little difficult. We can handle that, too; but that is something you need to stop and think about.

Now, then, with the transfer of personnel during times like these, there is another hurdle that is going to be very difficult; but, again, it can be done. There will be confusion, and this is not particularly a good time for confusion. When we come down to the efficiency of the Service, there are two things to consider. One is the dental treatment itself, that is the ordinary treatment. I would say it would be just as good under one system as it will be under the other; it won't make any difference. These men are good men and, as far as the professional side goes, I have no feeling about that; it will operate one way just as well as the other. But let us look at the other side, the responsible side that we have to the Navy—the service that we give, the naval side of things. Can we then improve it? My feeling is that we cannot; there will be none that I can see. I am responsible to the Navy and to the Secretary for the health of the Navy. I was disappointed yesterday when I heard some of my good friends say that they did not believe dentistry was really a part of medicine. Now as far as medicine itself is concerned, the degree of doctor of medicine—no. That is different. But when we say we can separate completely one part of a health organization and set it aside, in my estimation you are decreasing the efficiency of an organization that must be responsible for the health of the Navy.

In every military organization there must be a head. And I know that is where the crux is, where the rub comes. But I remember very well I was senior medical officer on a combatant ship one time in the last war, and I had to operate through an executive officer who was junior to me. I was the head of a department on that ship, and I was senior to the excutive officer, but I operated through him through the war, because that is the way we do business in the Navy. And it did not hurt my feelings in the slightest.

There is one misapprehension again that I should not speak of. I think, however, no matter where you are in the service, it is a rare thing when you do not have some one senior to you somewhere and, no matter what organization you are in, you are going to have to operate through somebody above you. That is, it is rarely ever that you can go directly to your commanding officer, unless you have a grievance; then any man can see him. Executive officers are put on board ship just for that reason; they are put on the stations.

So it comes down to the proposition of personality and, as some of the doctors said, some of our dentists do resent—I have seen it—they resent having to get the permission of a doctor, not a line officer, to go ashore to play golf, or permission to go ashore, or go on leave. I know those things are true. Why their feelings should be hurt, heaven knows; I do not know. I do not see why. It should not make any more difference to the dentist to go to a medical officer and request permission to go ashore, than to go to a junior officer who might be "officer of the deck," acting for the executive officer, or the commanding officer. Anyway, that is a point; I will agree that is where the most of this rub comes.

Now I am terribly pleased with the way the Reserve officers have worked out. I have nothing too good to say for them. They have done a marvelous job. We started with less than 300 regular dentists when this war began; we have a little over 500 now. Of those 500, we have ten Reserves for every one of them. Now, it is not easy for a man to come out of civil life, who is a very good man professionally, we will say, who makes a good living, who is completely independent,

and I will say this is just as true of the doctor of medicine as it is of the dentist. They are individualists, all of them. I know them; I have lived with them a long time. They come into our service and we do live in a much different way. They have to learn how we live, and some do not like it. One of the outstanding specialists in this country came into me a couple of days ago. He is going on a very important mission. He said: "I would just like to tell you something." He said: "You know I used to think I was a big shot, and I was, in my own outfit. This has done me a world of good. I have found there are any number of people who have as good ideas as I. And I think when I get out of the service, after the war, I am going to be of a lot more use to the clinic I am in." It takes a little while for people to learn these things.

What I am getting at is this, that whether you set aside the dentists as an entity or whether they stay as they are, these men are in military service. It is a service that has nothing to do with personalities at all. We have a definite job to do and that job has to be done as one tremendous team—the Navy. And the Navy is the fleet. And when we do things that upset the organization of the fleet, we have done damage.

So I dislike very much at this time to see a reorganization take place whereby we must upset routine in the fleet—routine with the forces overseas, with the Marines, and so on. Surely, as this bill reads, they will operate under the Surgeon General; but, as Mr. Cole said yesterday, how anyone could know this thing is going to operate, the way the bill is drawn—he did not use just these words, but he implied it—would be beyond him. And I have read it and reread it and I must say, if this is handed to me the way it is, if this becomes law and is passed, I would need to use a lot of ingenuity in finding a way to make the thing operate without confusion. One thing I do not think should go in this bill, the way it is written: If a department of dentistry is set up, I do not believe that the head of it should be selected by the President of the United States. I think the echelon is not that high. I think certainly that should come in the province of the Secretary of the Navy.

So I would like to have the committee understand I have no personal animus at all in this thing. I have a job to do and I am trying to do it. And when I say "I," I mean all the people with me; I am not speaking just as a person. You have been perfectly fine to us, and so has the Appropriations Committee; you have given us everything we have asked for, and I think we have done a good job with it. In fact, I am sure we have, because our results show. I am having prepared now for this committee a very complete report of just what the medical department of the Navy has done in these last two years, and I think you will all be interested in it.

So what I want this committee to understand is that when and if you feel that it is wise to make this change—and it is up to you, of course—there are many things you have to give consideration to other than just setting up something that will make some of our personnel a little more happy. I think the efficiency of the Navy is the thing you must consider.

I think that is about all I have to say, Mr. Chairman.

The CHAIRMAN. Thank you very much, Admiral. Now are there any questions that any members of the committee want to ask?

Mr. IZAC. Admiral, of course, we all have the greatest respect for you and your whole Medical Corps, but do not you remember a few years ago when the Army almost tipped things over by naming a medical officer chief of staff? And, from that day on, in both the Army and Navy, we have had medical officers and staff officers in positions of command, and now there is only one group, as I see it, that does not have that chance to so operate, to so function, and that is the Dental Corps.

Admiral MCINTIRE. Yes; that much is correct. I think you are right.

Mr. IZAC. Now, I think you are going to eliminate any friction if you will give the individual dental officer the same consideration that you give to your medical officer, and that is all I think this bill seeks to do.

Admiral MCINTIRE. If that was all, Mr. Izac, if that was all it intended to do, that would be a very simple procedure. But that is the difficulty; it does not do that. It would be a very nice thing if we could just say, "Now all we will do is to straighten out the personal side and let it go at that." But it does not do that. I have had as careful a study made as I can of just what will really happen here. I have a chief clerk who has been in the Navy for a long time; he is one of the most factual individuals I have ever known, and I had him just set down for me his own ideas of what would really be necessary and out of those came some of the things I have given you this morning. I do not think we can do it that way. As I say, on the training station, I can see no reason at all why we could not set it up in this way.

The CHAIRMAN. But you can do that by executive order?

Admiral MCINTIRE. That can be done administratively, as far as that goes.

Mr. RIVERS. Yet it has never been attempted?

Admiral MCINTIRE. That is perfectly right.

Mr. RIVERS. Let the record show that.

Admiral MCINTIRE. That is perfectly right; it has not been done.

Mr. IZAC. I am going further now; I am thinking now of the fighting ship, the big man-of-war, that requires a good many medical officers and dental officers. There may be half a dozen. Now why should not those officers rank in accordance with their rank? I know how this affects the old "mustang" to have to come up and take orders from an ensign

right out of the Naval Academy. You know, too. And here you have, maybe, a three-stripe dental man asking permission of a junior lieutenant, a medical officer, to go ashore. I grant you it does not happen often.

Admiral McIntire. No.

Mr. IZAC. But it does happen, and you know as well as I that it has happened.

Admiral MCINTIRE. That is a little bit far-fetched.

Mr. IZAC. But it has happened.

Admiral MCINTIRE. It could happen, of course; but that again—in fact, when you come right down to it, you see I get around, too, and, in fact, I make it a very big point to get around. Of course, possibly they may be afraid of me, but I did not know I was such a forbidding individual. In fact, I took a look at myself last night, after hearing some of the things said here, and I said maybe I had been fooling myself, which is one of the things I never try to do——

Mr. COLE. When you looked at yourself, did you see those three stars that you carry?

Admiral MCINTIRE. I always do that; in fact, I am a little overwhelmed by them.

Mr. IZAC. You see, the whole idea of this is that we cannot have a senior officer being subordinate to a junior officer. I see that more than anything else I can see in the bill.

Admiral MCINTIRE. You are an old Navy man; you have seen those things done. I served in the last war under a junior to me.

Mr. IZAC. But he was a line officer.

Admiral MCINTIRE. What is the difference?

Mr. IZAC. Because the line of the Navy has always been in command.

Admiral MCINTIRE. That is all right.

Mr. MAAS. No; it is the executive officer of the commanding officer who speaks for the commanding officer.

Mr. IZAC. He is in substance the commanding officer.

Admiral MCINTIRE. All right; but you are talking now about hurt feelings; we are talking about questions of personality.

Mr. RIVERS. You admit that condition exists.

Admiral MCINTIRE. Oh, in some instances, yes, it does. There is not any question about that.

Mr. RIVERS. Well, you cannot destroy a man's personality completely.

Admiral MCINTIRE. Of course you cannot. It would be a fine outfit if you could. But I still disagree with you, Mr. Izac, on that proposition; because whenever the medical organization on one of those big ships is right, you have a number of doctors, a number of dentists, and a rather large number of Hospital Corps men; but, when you spread it out, they are mighty thin. Now you have to do this as an integral proposition. You cannot do it if you are going to divide them.

Mr. IZAC. I think you can.

Admiral MCINTIRE. How?

Mr. IZAC. You have your executive officer.

Admiral MCINTIRE. After all, somebody has to head the organization on the battle side. You cannot have two heads; that is one thing you cannot possibly do.

Mr. IZAC. You are going to have the commanding officer acting through the executive officer assigning the jobs aboard ship.

Admiral MCINTIRE. You have this where the medical officer makes up the battle organization and submits it to the executive officer and commanding officer to approve or disapprove and, once that is done, no commanding officer is going to let any of his people shove him around and tell him "I won't work with this group." You go right back in the place you were before, the dental officer under the medical officer.

Mr. IZAC. I think where you have that kind of organization you can handle it very well; but in some instances you are going to have a senior dental officer and just a junior medical officer.

Admiral MCINTIRE. You won't have that happen once in a hundred times, I can assure you; because I know what happens when detailing personnel. I am very sure I can even tell you who the key people are on practically every major ship in the United States Navy today. I am very careful to see that those things do not happen. The same thing on our shore stations, because I know what happens with the personnel; I know exactly how they feel, and it has always been one of the regretful things, that we cannot change human nature. I have every sympathy for the man who has that kind of complex—but it is there.

Mr. BATES. You have in mind that the purpose of the bill can be accomplished without legislation. Have you any suggestions that might be put into operation to modify the situation as it is from which these complaints emanate?

Admiral MCINTIRE. The only place, Mr. Bates, I see we could give autonomy to the senior dentists without upsetting things, without upsetting the organization, would be around places like training stations, or navy yards—something on that order. Other than that, I do not see how it could be done under the way we operate at the present time.

Mr. BATES. Then, of course, you could do that by your own orders?

Admiral MCINTIRE. Well, the Secretary could authorize that; that could be done by regulation.

The CHAIRMAN. That seems to be the main complaint of the men, probably, judging from the remarks of the members of the committee and of the witnesses yesterday.

Admiral MCINTIRE. Mr. Chairman, remember this: We have some very excellent men in the regular Dental Corps, you know. I have a man who is doing a grand job and has seen a great deal of the dental organizations in the Navy in this past year and who is now a rear admiral in the Dental Corps. I would be very glad to have him come before this committee at any time; I would

be very glad to have the Chief of the Dental Section come before this committee. You have not heard from them; you heard, of course, some quotations.

The CHAIRMAN. The suggestion made by Mr. Izac and the suggestion by Mr. Rivers and others seems to me to be the main bone of contention—that a senior dental officer has to get permission, oftentimes, particularly on the shore stations, from a junior medical officer. Now, to correct that, you would not necessarily have to have legislation; would you?

Admiral MCINTIRE. No. On a shore station, that could be done.

The CHAIRMAN. Now that seems to be the whole complaint.

Admiral MCINTIRE. But that is not going to solve the situation.

The CHAIRMAN. Of course it is not.

Admiral MCINTIRE. That is not the point—

The CHAIRMAN. It is purely a personal question. With some, it would not amount to a hill of beans; with others, it amounts to a great deal.

The thing I am very much disturbed about is duplication of the Hospital Corps on board ship. From what you have said, if there is a provision as suggested by this bill, then there must be Hospital Corps men for the medical service and Hospital Corps men for the dental service. Is that correct?

Admiral MCINTIRE. That is correct.

The CHAIRMAN. Then why is not that a complete duplication of service?

Admiral MCINTIRE. There will need to be duplication.

The CHAIRMAN. And with reference to the matériel men, too, there would be a complete duplication?

Admiral MCINTIRE. All of those things will be necessary, as I see it.

Mr. IZAC. May I ask this at that point: Is the same type of duty performed by the Hospital Corps man as by the dental technician?

Admiral MCINTIRE. No; not at all.

Mr. IZAC. He is a technician today, but we did not take that over.

Admiral MCINTIRE. That again is one of the four points, and that brings us to another thing, the feeling of the enlisted man in the situation. That is something that does not seem to have been considered, the enlisted man's feeling in this matter. The Hospital Corps man who is attached to the ship does not ask this; and he is also an individualist, and he is a specialist; yes; but he is a Hospital Corps man.

Mr. IZAC. But is he needed as a dentist's technician?

Admiral MCINTIRE. Yes.

Mr. IZAC. And required for that.

Admiral MCINTIRE. We must keep in mind that we do not have men in specialist corps who do only one task on a ship; we cannot do that.

The CHAIRMAN. Members of the committee, we will have to adjourn now. We will meet again at 10 o'clock Monday.

(At 11:45 a.m. an adjournment was taken to Monday, June 5, 1944, at 10 a.m.)

HOUSE OF REPRESENTATIVES,
COMMITTEE ON NAVAL AFFAIRS,
Monday, June 5, 1944.

The committee met at 10 a.m., Hon. Carl Vinson, chairman, presiding, for further consideration of H. R. 4216.

The CHAIRMAN. Let the committee come to order. This is a continuation of the hearing on H. R. 4216. Admiral McIntire, will you please come back to the stand?

Admiral MCINTIRE. Yes, sir.

STATEMENT OF VICE ADMIRAL ROSS T. McINTIRE, SURGEON GENERAL, UNITED STATES NAVY

The CHAIRMAN. Admiral, when the committee recessed the other day, you had not finished your statement, nor had the members of the committee had an opportunity to question you. Is there any further statement you want to make before the members start asking questions?

Admiral MCINTIRE. Mr. Chairman, I think, probably, to save time, it would be just as well to ask the members to go right ahead with their questioning.

The CHAIRMAN. Mr. Rivers.

Mr. RIVERS. I do not know whether I can take up where he left off or not.

The CHAIRMAN. All right, go ahead.

Mr. RIVERS. If my memory serves me correctly, Admiral, in your testimony you mentioned the fact that you had to go home and look into the mirror to see whether you had horns on or something like that.

Admiral MCINTIRE. That is right.

Mr. RIVERS. I do not recall distinctly having heard anybody reflect on you primarily, or make any innuendoes about you or the manner in which the affairs of your department are conducted.

Admiral MCINTIRE. Not to me personally, no; because these men are all friends of mine, and they understand me, but if you will just think over all of the implications, I think I had reason to take a look at myself, but that is not disturbing me, Mr. Rivers. The thing that is disturbing me on this whole business is how will I administer this set-up if this bill is passed and becomes a law the way it is written here. That is the thing I much concern myself with, because I must do the best job I can with what is given me, and I will say when you read the first paragraph of your bill it says very clearly and very distinctly that the Surgeon General will be responsible for the administration of the Department of Dentistry in the same manner that he administers the Medical Department. Now, that takes in quite a large scope.

Mr. RIVERS. That is not a superhuman task, is it, sir?

Admiral MCINTIRE. No, it is not; but think what it does. So, that is the thing I am

concerned with in this period of war, the duplicating of the medical set-up, not in peacetime.

Mr. RIVERS. Well, of course, Admiral, you have seen many bills offered before this committee which were amended in the committee. Now, the thing that disturbed me was your saying that they reflected on you, and, of course, I do not think you meant that entirely, Admiral. What they complain of is that they cannot get to you through these medical people who have not complete sympathy with dentistry.

Admiral MCINTIRE. I disagree with that completely, because they can get to me and do.

Mr. RIVERS. Of course, you know that I have nothing against you, Admiral McIntire. I know you are the best Surgeon General I have ever met, and I have met several of them. I think you are doing a fine job, and this thing is designed to assist you.

Admiral MCINTIRE. Well, I would like to know when it is impossible for any of my people to see me. I do not care whether they are the heads of departments or men from the field, they all have access to me. I am one of the easiest persons to see, I think, anywhere in the Navy Department.

Mr. RIVERS. In your very complex set-up, with the far-flung theaters of operation in which you operate and the many stations in the Nation, how can they really get a problem to you through the medical end of it?

Admiral MCINTIRE. Well, it is not difficult. In the South Pacific we have a young dental officer who has done a grand job down there operating through the fleet and his reports have come in right along. In fact, they have come in very directly. Admiral Halsey has always permitted his people to make direct reports. We have a man in the Southwest Pacific attached to the area fleet who is doing a splendid job. Those are men who can cover things and I am sure that they are very honestly reporting defects and things that are not satisfactory, and they do cover the field.

There is one thing that we have not done, and a thing that we need to do, and that is to have a dental officer who is out in another area, who is able to cover more of the field than we are covering right at this time, and that I hope will be done. It cannot be done just at this minute for a number of reasons.

Mr. RIVERS. You also mentioned the fact that Mr. Cole observed shortcomings of this piece of legislation. Mr. Cole has made some suggestions to correct it.

Admiral MCINTIRE. That is fine, and I would expect him to.

Mr. RIVERS. Have you any suggestions to offer to correct it, Admiral?

Admiral MCINTIRE. No; because I cannot at this point.

Mr. RIVERS. In other words, you want to continue that feeling that exists instead of correcting conditions?

Admiral MCINTIRE. I have not said what I am going to do on that subject yet.

Mr. RIVERS. You are just about ready to do it?

Admiral MCINTIRE. I have not said what I am going to do, because this bill is a confused affair and there is duplication, as I see it, that will be very necessary to eliminate to make it really operate and operate right. There is no use for us, if we are going to try to correct some personal grievances, and they are there, and a lot of them are justified, to correct them part way. Human nature is human nature, and you are going to get a lot of trouble in every organization from personal differences and we do get it. If we are going to correct these things, and we must honestly try, because I want to see the personnel as satisfied as we can possibly get them, but if we are going to do it there is no use to do something that will only correct a thing in just a part way fashion.

Mr. RIVERS. You say there are inequities in your organization as you see them, I mean in the over-all organization, injustices, or whatever term you use, people are dissatisfied. Is that view shared by the dentists of the Bureau of Medicine and Surgery?

Admiral MCINTIRE. I do not know whether they look at it as I would look at it or not. In the operating side you have some men here today who can speak for themselves, and in fact with deliberation. I asked one of our representatives to come in here and let you know just exactly how he looked at things, and he can come up before this committee and speak as freely as he wishes to speak. He is not tied in any way, shape, or form, and he knows it, because that is the way we do business.

Mr. RIVERS. I understand that, Admiral.

Mr. BATES. Is it not a fact, also, Admiral, that the regulations provide that any officer in the field who wishes to take a matter up with your office, that a letter addressed to you shall clear through channels until it gets into your office for personal consideration?

Admiral MCINTIRE. Without question.

Mr. BATES. And it does?

Admiral MCINTIRE. Yes; there is no doubt about it.

Mr. RIVERS. Provided it goes through the right side?

Mr. BATES. No; that is a regulation, that any letter addressed to the Chief of the Bureau must clear through channels, even though it may be from somebody in the ranks.

Mr. RIVERS. You know that all of the dentists are subservient to all the medical doctors in the Bureau of Medicine and Surgery; you know that?

Mr. BATES. That may be so.

The CHAIRMAN. Let Mr. Rivers finish his questioning, Mr. Bates.

Mr. RIVERS. You have referred this bill to your dentists in the Bureau of Medicine

and Surgery, have you, Admiral?

Admiral MCINTIRE. Yes, indeed.

Mr. RIVERS. Did they give you an opinion on what they felt about the intent of this bill?

Admiral MCINTIRE. Yes; I know how they feel about it. They have a very honest feeling, I believe. In fact, I know it is their honest feeling that we would not need to do all of the things that I see in this bill to make it operate. Now, I disagree with that because I have had to operate the Medical Department for several years, and I have come before this committee and the Appropriations Committee, and I know what it takes to make the Department run. I learned it the hard way, and I know what the responsibilities are when you handle material and Government money. When you give a man the responsible proposition of handling a department or of administering a department, you must give him his means of working out his responsibilities and discharging them. You cannot, in my estimation, set up a separate department without giving it its own finance section and its own material section.

Mr. RIVERS. You have just recently reorganized your supply setup in the Bureau of Medicine and Surgery, have you not, Admiral?

Admiral MCINTIRE. Yes, indeed; and we have a material section that we think will function very well, especially in view of what we see in postwar supply, and that takes in the entire Medical Department.

Mr. RIVERS. You certainly have to have a separate financial set-up when you go before the Appropriations Committee with your estimates as to what you will use for medicine and dentistry, do you not, or do you just throw them all into one lump sum?

Admiral MCINTIRE. The budget we bring before the Appropriations Committee, Mr. Rivers, is set down very clearly and the Dental Section, very naturally, has its own budget; that is, dental supplies and so forth, are all worked out, as well as dental equipment, and I can tell you, of course, how much money I am going to ask for. I can tell you exactly what the dental estimates will be because I know pretty well what their issue rates are.

Mr. RIVERS. How can this change that?

Admiral MCINTIRE. Through a duplication of financing and handling material.

Mr. RIVERS. What about Captain Davis over there; does he not run it?

Admiral MCINTIRE. The Dental Division at the present time.

Mr. RIVERS. Why can he not continue to do that?

Admiral MCINTIRE. Because he will not be in the Medical Department.

Mr. RIVERS. No; we do not want him in the Medical Department. That is what this bill is designed to do, to change that.

Admiral MCINTIRE. You are correct; and so for that reason we must set up a separate department.

Mr. RIVERS. You have 5,000 dentists in the Navy, and if their morale is improved, and if you get the maximum efficiency from them which you cannot get if a man is in the slightest degree dissatisfied it will be worth it in dollars and cents. I think that, and a lot of other people think that, with all due deference to you, and I have the greatest deference for you, Admiral McIntire. Every man who comes before this committee says we want to stay under Admiral McIntire, but we want to get out from under the doctors in the Navy.

Admiral MCINTIRE. I have not any personal animus to any one. I have done everything possible to boost the professional side of dentistry since I have been in this job. I have done everything I can to increase their professional excellence because it helps the whole medical set-up and the Navy.

Of course, I look at dentistry a little differently than a lot of people. I still insist that dentistry has a very marked place in medicine. I do not consider that we should just feel that a good dentist leaves himself to his little oral field, and I probably have as good an estimate of that as most people because through many years I had a specialty that I ran in addition to my naval specialty. I think it is rather narrow for us to consider the fact that a good dentist should not know all about the diseased conditions that might emanate from his field or vice versa from the medical field, and moreover he certainly needs to know a bit about modern medicine, because we have many things today that will short-cut a great many of the local things that we do around the head and around the mouth. I can say again that a great many of our dentists have been keeping up on these things. So, that is one of the reasons why, again, I feel that dentistry has a very real place in the Medical Department.

Mr. RIVERS. It should not have a subservient place to medicine, should it?

Admiral MCINTIRE. No; we do not want them to have a subservient place, and, of course, they are not subservient. I cannot see where people are subservient in a military organization. I cannot say that I am subservient, because I still have higher authority over me, for I am in the naval organization. If I could not take higher authority I would have gotten out of it long ago. So, I look at it in that light. I am trying to bring up for this committee's consideration the various obstacles, the various things that will occur in case you decide to pass this bill. If you do, that is all right. As I have said it is up to you after you have seen all of these things and have heard the facts. Then if you consider that it is the thing to do, that is all right, you will not hear one word out of me.

Mr. RIVERS. Admiral, to refresh my memory, and that of the committee, would you mind enumerating for the committee again those pitfalls which will result if the intent of this bill is passed, if we separate the Dental Corps from the Medical Corps?

Admiral McINTIRE. I gave all of those the other day when I testified.

Mr. RIVERS. The objection to making the change during the war is not any excuse to fail to improve any service. You heard Mr. Izac's question about a combat ship. I think he covered that, as he served aboard a combat ship.

Admiral McINTIRE. But he did not cover it too well.

Mr. RIVERS. I think the budget can be arranged. I do not know of any other objection to it, other than some reflecting on you, with which I respectfully disagree.

Admiral McINTIRE. That was just a very pleasant thing that came along, which I felt should, at least, be commented on.

Mr. RIVERS. I do not recall any other objections that you raised to it, Admiral.

Admiral McINTIRE. All right; suppose, then, that I start in again and go down the line.

Mr. RIVERS. All right, sir.

Admiral McINTIRE. Well, to put up just one very minor objection, and that is on the organizational side, you will need to shift over, of course, your entire dental personnel from the Medical Department to the new Dental Department. That will mean a change in the present legal status of all dental officers. That is one thing.

The next important matter is record keeping. Now, that is really important. Remember that now we consider that the dental records and the medical records are all a composite affair. The Bureau of Personnel will have a stake in this as well. That is going to really create quite a proposition in paper work and in organization. That is something that must be given very serious consideration.

The next point, as I remember, as I went along down the list, was the proposition of duplication of handling of enlisted personnel, duplication of material and duplication of financing.

The one point, as I remember, as I went through these, where I felt that damage would not be done, would be on large training stations, with one exception of the question of record keeping, which will mean a great deal in volume.

My great objection was what it does in the field—duplication of organization of your health sections.

If you wish to divorce dentistry from medicine, very well, but still we must consider them a part of the health organization, and so on board ship you will need then to set up two organizations, a medical department and a dental department on each ship. That will mean quite a little difference again in organization. At the present time, of course, they are all located together, in one department. I am now talking about the enlisted personnel, who will be trained in an entirely different fashion from Hospital Corps men. The medical department trains them now and duplication of training would come about.

Mr. RIVERS. You certainly have the benefit of the experience you have had in the past, and it would come under your surveillance, and you would be cognizant of the training they would require.

Admiral McINTIRE. Yes; but the Director of Dentistry must be given his chance to run his show. He is going to run this thing, and he is going to be the man who simply keeps me advised of what he needs, and what he is doing. So he must be able to handle his own personnel. As I see it, this is mainly a personnel proposition anyhow. The intent is more personnel than anything else, but he has his own enlisted personnel that he has got to handle, and that is another complicated thing as I have shown. When we get down to record keeping he is going to need more enlisted personnel to keep his records, because there will be more to it than there is now, and the amount of paper work and supply work will be greater.

Mr. RIVERS. What percentage of the Navy's personnel is in the Bureau of Medicine and Surgery?

Admiral McINTIRE. You mean compared to the enlisted personnel?

Mr. RIVERS. Compared to the enlisted personnel, what percentage is in the Bureau of Medicine and Surgery?

Admiral McINTIRE. You mean as far as the whole service is concerned?

Mr. RIVERS. Is it 3 per cent or something like that?

Admiral McINTIRE. Oh, no.

Mr. RIVERS. What is it?

Admiral McINTIRE. At the present time we are running now in the Navy less than four medical officers per 1,000 of enlisted strength, and as to the dental officers we base them on about one to 500 of the enlisted strength.

Mr. RIVERS. Are you utilizing that ratio?

Admiral McINTIRE. Yes, we are—we have at least about that. We have now, as I remember, something slightly under 5,500 dental officers on active duty in the Navy.

The CHAIRMAN. How many hospital corpsmen?

Admiral McINTIRE. As to hospital corpsmen, to come close to it, we have assigned as dental technicians and prosthetic technicians, and so forth, something over 7,500 of these. Some time ago, we were allotted 1.5, as I remember it, dental technicians to each dental officer on duty.

Mr. COLE. What was that again, Admiral?

Admiral McINTIRE. One and one-half enlisted personnel for each dental officer on active duty. That is, he must be a special technician. We are not far off of that number. We were a little under that for a while because it takes some time to train men, with the Navy growing as fast as it did, and with this prosthetic program we lagged a bit, as I remember, with our dental technicians, but

with 7,500 or more now and with about, I think, 1,400 in training at this present time, that is close to the 1.5 mark. So, you see, that side of it is being fairly well kept up.

Mr. RIVERS. Well, this could not materially affect that in your over-all set-up.

Admiral MCINTIRE. Oh, this would affect that, Mr. Rivers, because these people are in the Medical Department now, but there is a great deal more than that to it. This is another place where we have the personal feeling that comes into the picture. Again, we are a military organization, and very often we have hospital corpsmen that do not like it when one man has special privileges and the man next to him does not have them, and you know how men are. They will say, that chap does not have to stand watch and I do, and I have worked all day, and while I take my watch at night he does not. Now, those things come up when you have special services, but on our combatant ships today every hospital corpsman on board ship has a job to do, and he has his detailed assignments and he has to do them.

Mr. RIVERS. You do not say that would not happen if we passed this bill?

Admiral MCINTIRE. You have got to set aside your Dental Department from your Medical Department. All right, now, the captain of the ship has to say, all right, you will function with your Medical Department or your antiaircraft gun crew just the same. Well, you have not corrected what you are trying to correct.

Mr. RIVERS. You are talking about a battle situation now.

Admiral MCINTIRE. We are at war, you know.

Mr. RIVERS. You do not want this committee to think that whenever they are in combat, the dentists will be free doing something else?

Admiral MCINTIRE. But unless they work day after day, and month after month with the medical organization, they are not going to be of any great use any more than a bandsman will.

Mr. RIVERS. I cannot follow you on that statement.

Admiral MCINTIRE. I can. I know what it takes to have a competent hospital corps in battle organization and you cannot do it unless you get training. While it will not take many more hospital corpsmen, nevertheless, you will need to increase the number of enlisted personnel on the ship to make up for setting aside of dental technicians.

Mr. RIVERS. If they are not utilizing the proper percentage of dentists now, they should increase them.

Admiral MCINTIRE. I cannot agree with you on that——

Mr. COLE. As I understand the situation now in the Bureau of Medicine and Surgery, you have at least four corps, the Dental Corps, the Medical Corps, the Nurse Corps and the Hospital Corps.

Admiral MCINTIRE. That is correct.

Mr. COLE. From the light study I have made of this question, two of those corps are created by statute, the Nurse Corps and the Hospital Corps. The other two, the Medical and the Dental Corps, are set up by the regulations.

The CHAIRMAN. Is that correct, Admiral?

Admiral MCINTIRE. No. The Medical and the Dental Corps are set up by law.

Mr. COLE. I would like to find reference to that. I have not been able to find where they have been set up by statute.

The CHAIRMAN. They were created by statute.

Mr. COLE. I have not yet been shown. I know the Hospital Corps was specifically authorized and established by statute.

The CHAIRMAN. Captain Ramsey, get the law on that.

Admiral GATCH. The act of 1912 created the Dental Corps.

Mr. COLE. Maybe by inference.

Admiral MCINTIRE. I think not, Mr. Cole.

Mr. COLE. Is there one person in charge of each of those corps?

Admiral MCINTIRE. No.

Mr. COLE. Who is head of the Nurse Corps; is there not a head of it?

Admiral MCINTIRE. Yes; we have a superintendent of the Nurse Corps.

Mr. COLE. Its head is called the superintendent?

Admiral MCINTIRE. Yes.

Mr. COLE. Who is head of the Hospital Corps?

Admiral MCINTIRE. No one is head of the Hospital Corps.

Mr. COLE. There is no one individual who is head of that corps?

Admiral MCINTIRE. No; we have a head of the division. We have a lieutenant commander of the Hospital Corps who is head of that division, but not as head of the Corps; no.

Mr. COLE. Who is head of the Corps, you?

Admiral MCINTIRE. As far as I can tell, I seem to be.

Mr. COLE. Do you have some officer or some individual who is head of the Medical Corps?

Admiral MCINTIRE. No. The Surgeon General comes as close to that as anyone would be.

Mr. COLE. Then there is nobody who is head of the Dental Corps?

Admiral MCINTIRE. No; there is not. There is only a chief of the Dental Division.

Mr. COLE. If I am right that the Dental Corps has not been established by statute, then I can see no reason why it should not be established the same as the Hospital and Nurse Corps have been created by statute and directed that they shall be under your supervision and under your regulations. If by statute there is a legally created Dental Corps now, then I do not know what the dentists are talking about.

Admiral McINTIRE. There is a legally established Dental Corps.

Admiral GATCH. Considered to be part of the Medical Department of the Navy.

Mr. RIVERS. Yes.

Mr. COLE It says:

> Dental officers in the Navy in the grades of assistant dental surgeon, passed assistant dental surgeon, and dental surgeon shall constitute the Naval Dental Corps, and shall be a part of the Medical Department of the Navy.

But, that does not create a Dental Corps. That just says they shall form a part of the Medical Department.

The CHAIRMAN. That creates the corps.

Mr. COLE. The historical note says:

> A Dental Corps to be a part of the Medical Department of the Navy was authorized by the act of August 22, 1912 (37 State. 344), which was superseded by new provisions on the same subject contained in the act of August 29, 1916, which was in turn superseded by the act of July 1, 1918—

but that does not establish by statute the Dental Corps' position.

So, I thought this whole thing might be corrected and give the dentists some recognition to which they feel themselves entitled if the Congress were to by statute establish a dental corps within the Bureau of Medicine and Surgery subject to the rules and regulations which might be prescribed by the Chief of the Bureau of Medicine and Surgery, and to have as head of the corps an officer appointed in the same manner and to have the same rank as the head of the Medical Corps of the Navy, but to have the two more or less distinct, and subject to your rules and regulations. Why could not that be done without interfering with the system?

Admiral McINTIRE. I would have no objection to that.

Mr. COLE. That would be pretty much the way it is now, except it would give statutory recognition to them.

Admiral McINTIRE. I would have no objection to anything like that.

I understand why our dentists feel, in many instances, that they are not given the autonomy that they should be given perhaps on some of our big stations where they feel, or the senior dental officer feels that he should be allowed to run his own show without having to bother with the senior medical officer. From the straight personnel standpoint and operating his own place there would not be any objection to that, but when you separate them completely you do have this proposition of record keeping, and that is going to be quite a difficult thing.

Mr. COLE. Why would you have to have different records?

Admiral McINTIRE. I am talking about the physical and the health records, and I am talking about duplication. It could be done, of course.

Mr. COLE. I would like to direct your attention to the third paragraph of the bill on page 2, and invite your attention to the effect of those provisions which describe the personnel of the Dental Department or the Dental Corps. First it says that it shall be composed of officers of the Dental Corps, which is about the same as you have got now. In subparagraph (b), it says:

> Chief warrant and warrant officers in numbers not exceeding 5 per centum of the total number of officers of the Dental Corps.

Is that about the way it is now?

Admiral McINTIRE. No.

Mr. COLE. I do not mean by law, I mean actually.

Admiral McINTIRE. No; 5 per cent at the present time would be what?

Mr. COLE. About 250.

Mr. RIVERS. There are roughly about 5,000 dental officers in the Navy.

Admiral McINTIRE. To come back to Mr. Rivers' question, if we are not going to set up separate material, and finances, and so forth, what are we going to do with these warrant officers?

Mr. COLE. Do you have warrant officers in dental work now?

Admiral McINTIRE. No.

Mr. COLE. None at all?

Admiral McINTIRE. In the Personnel Division, we have a warrant officer. However, he is a Hospital Corps officer. He was a warrant officer, but I think now he has been promoted to commissioned grade. He was a warrant officer, but he came up through the ranks as an enlisted man, chief petty officer, and warrant officer, and I am pretty sure he has been put in the temporary commissioned rank. His detail in the Bureau is looking out for dental personnel among hospital corpsmen. We did that because we found there was some confusion about getting our men in from the field when we had this quick expansion and needed to find where these technicians were, and so, this, I believe, is the only one we have. There may be some others.

Mr. COLE. But very few?

Admiral McINTIRE. Yes; very few.

Mr. COLE. No warrant officer serves in the Dental Corps except that one?

Admiral McINTIRE. We might have some others that I have not followed. I may be wrong on that, but there are not a great many.

Mr. COLE. How about hospital corpsmen who are advanced to warrant officer grade?

Admiral McINTIRE. There have been many of those men who, after they have gotten up to chief petty officer, have gone on in other fields. That is, instead of staying in dentistry, many of them have felt that they did not have a chance for advancement and they have gone into a wider field. Of course, the dentists have complained about that, that they have lost hospital corpsmen that they could have retained if they had had other outlets for them, and so some of those people have been lost to the general service, and those men have gone on to promotion in the Hospital Corps. I imagine we could probably

find some of them who are now out in wider fields.

Mr. COLE. There is not much need for warrant officers in dental work, is there?

Admiral MCINTIRE. The only need would be here in time of peace, where we could use them in the Dental Department. We could use a warrant officer in the field of finance, and we could use him in this field of record keeping, and also in material.

Mr. COLE. But you would not be using them as dentists, they would be more as accountants?

Admiral MCINTIRE. No; not at all. You then again would run into personal feeling if you did it, because, after all, we are all very touchy where we are assigned when we get up to certain grades, and that takes in the medical side just the same. I would not know what to do with them. I am very frank to tell you that.

Mr. COLE. I can see where that would give you a good deal of worry and concern, because I cannot visualize where a warrant officer would be used in dental work.

Admiral MCINTIRE. The only thing you are doing there is confusing the Hospital Corps men question, and, of course, Mr. Rivers and I are very much interested in the Hospital Corps set-up. That is another thing that is going to confuse him later on, when we get down to talking on this. We have got it drawn up. Admiral Jacobs has not had an opportunity to go over it thoroughly yet. That is going to concern this committee, as you must find an outlet for these smart, expert Hospital Corps men, and what are you going to do with your warrant officers?

Mr. RIVERS. There should be some place for the warrant officers.

Admiral MCINTIRE. Where are they going to work?

Mr. RIVERS. You should be able to work it out.

Admiral MCINTIRE. Let us be practical on this.

Mr. RIVERS. Excuse me, Mr. Cole, if you had not finished.

Mr. COLE. As I know dentistry, it is only from being a patient, but you have dentists, and you have technicians, and there is no intermediary between them, and I cannot see where there would be in the Navy and dental work for warrant officers.

Admiral MCINTIRE. Not unless we are going to set up a very elaborate structure, which I do not think would be necessary.

Mr. COLE. Unless you envisioned that dental work which, ordinarily, is performed by dentists might be done by the warrant officers.

Admiral MCINTIRE. I would not think that, no; that would be bad. I would not think of that.

Mr. COLE. Stepping down to the third subdivision about the enlisted personnel, it prescribes that there shall be "such number not to exceed 166 per centum of the total number of dental officers." You say now it is actually about 150 per cent?

Admiral MCINTIRE. That is practically so.

Mr. COLE. So that provision would not upset your present program?

Admiral MCINTIRE. No; but I think on this you would need more enlisted personnel, because you will need them for a lot of extraneous things that are now done by members of the Medical Corps, but 166 per cent would probably cover it. I would not complain of that figure, because I think that is a very fair estimate.

Mr. MAAS. The only surplus would be the difference between 150 and 166 per cent, because 150 per cent is drawn from the Medical Department.

Admiral MCINTIRE. Yes; and in fact, we could use 166 as a fair figure.

Mr. COLE. I cannot understand why you have four separate corps in your Medical Department when you do not have any individual identified as head of each one of the corps. I am surprised to learn that is the case.

Admiral MCINTIRE. Well, as to the Nurse Corps, it is very necessary that you do have an operating head. In fact, she operates in exactly the same fashion as does the head of Preventive Medicine, or the head of our Planning Section, or the head, we will say, of Fiscal Records, completely responsible for the operating and handling of all of the personnel in those sections, and as to the Hospital Corps, we have found it works very well with heading it up, as we do, with a Hospital Corps officer.

Mr. MAAS. How do they get to be Hospital Corps officers?

Admiral MCINTIRE. They come up from hospital corpsmen, and that is something that we need to straighten out.

Mr. MAAS. Do you have them in peacetime? I understand you do in wartime, but do you have Hospital Corps officers in time of peace?

Admiral MCINTIRE. Yes; we do.

Mr. COLE. For the information of the committee on this question of the statutory creation of the corps, I would call your attention to the fact that the Hospital Corps was established by the act of 1898—

The Hospital Corps of the United States Navy is hereby established—

and the Nurse Corps was established in 1908.

Admiral MCINTIRE. Yes.

Mr. COLE. It says:

The Nurse Corps (female) of the United States Navy is hereby established—

but there is no statutory creation of either the Medical or the Dental Corps, as I see it. That being so, I see no reason why the Congress should not create a dental corps in the same fashion as it created the Hospital Corps and the Nurse Corps, and maybe that will take care of the problem that we have facing us.

The CHAIRMAN. Let me read this memoran-

dum, and this will answer the point Mr. Cole has in mind. [READING:]

The Secretary of the Navy shall within sixty days after the date of the enactment of this Act reorganize the Bureau of Medicine and Surgery in accordance with the provisions hereof.

SEC. 2. The functions of the Medical Corps and those of the Dental Corps shall each be defined and prescribed by regulations of the Secretary of the Navy and each such corps shall have a Director who shall be responsible to the Chief of the Bureau of Medicine, Surgery—

and so forth.

Mr. COLE. Is that a proposal, or are you reading the existing law?

The CHAIRMAN. I am trying to get the benefit of the admiral's viewpoint.

Mr. RIVERS. Have you and the Surgeon General gotten together on this?

The CHAIRMAN. No, sir; I have not; I have never read it to him before. [Reading:]

An officer of the Medical Corps of the Navy shall be detailed as the Director of the Medical Corps and an officer of the Dental Corps of the Navy shall be detailed as the Director of the Dental Corps. Such officers—

and so forth.

Now that meets the point raised by Mr. Cole a moment ago of having a head and being recognized by statute, the dental organization in the Medical Corps, and the Medical Corps to be known as the Bureau of Medicine, Surgery and Dentistry. What do you have to say about that?

Admiral MCINTIRE. That takes in a pretty broad field, Mr. Chairman.

Mr. CHAIRMAN. You better not agree to it too quickly.

Mr. RIVERS. No, Mr. Chairman, I know you would not touch my bill.

The CHAIRMAN. Is that proposition sound, Admiral; is it a logical proposition?

Admiral MCINTIRE. That takes in quite a lot of territory, Mr. Chairman.

The CHAIRMAN. Yes; it does. [Reading:]

The Bureau of Medicine and Surgery shall hereafter be known as the Bureau of Medicine, Surgery, and Dentistry.

Now, then, you see, we create a head of the Medical Corps, and we create a head of the Dental Corps all under the Surgeon General.

Mr. COLE. The rank you have given the director is too high.

The CHAIRMAN. That may be true.

Mr. COLE. The chief of the Bureau is a rear admiral himself.

The CHAIRMAN (reading):

Such officer while so serving shall have the rank, pay, and allowances of a rear admiral.

Now, we already have the rank of rear admiral in the Dental Corps.

Admiral MCINTIRE. That would need some further careful looking over, Mr. Chairman.

Mr. MAAS. On your discussion that it would disorganize the fleet if you had a Dental Corps with their own administration of their corps, I do not quite see your point. How would it affect the organization of the fleet? Do you mean within each ship, or within the organization of the fleet itself? You made reference the other day to disorganizing the fleet, Admiral.

Admiral MCINTIRE. No; not the entire fleet; but it would disorganize the battle set-up on board ship very badly.

Mr. MAAS. Why would it? The commanding officer of the ship makes all assignments.

Admiral MCINTIRE. Of course he does. The commanding officer sets up his battle organization, and he says to his heads of departments, your duty is thus and so, and you give me your organization, which is done, and that is worked out and integrated on every ship and with every organization in the fleet. The Medical Department satisfies the commanding officer that the set-up that they have worked out for the handling of battle casualties is efficient, and that is their mission in any organization. It is purely that, and that is my proposition.

The next thing is these men are all considered noncombatants, too, and a ship has just a certain number of spots that you can put personnel in. They are all overcrowded now, unfortunately, they have to be because of the things we are doing. So we cannot step up our organizations, and we have learned the hard way, too, as to what we have to do to do these things efficiently. In this peculiar type of warfare we are fighting, we must have all battle stations manned and thoroughly manned by well-trained personnel and with the men we have aboard ship right now.

Mr. MAAS. How would that be changed?

Admiral MCINTIRE. That will be changed, Mr. Maas, in this way: If we are going to accomplish what is wanted here, and set aside the Dental Department from the Medical Department, and take it out from under the medical officer, so that he does not have jurisdiction over the Dental Department, that means a certain number of corpsmen, plus your dental officers eliminated for that work. Now, the commanding officer of the ship could say to them, that is all well and good, back you go, and you operate just the same with this medical organization. All right; that would work; but, perhaps, a lot of commanding officers would say that won't go because of the feeling and the morale of the men, the hard feeling between those corpsmen, and that will not operate well, and we will utilize them in their own fashion.

(Continued in next issue)

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PENICILLIN: UNKNOWN QUANTITY IN DENTISTRY

Penicillin, the most promising antibacterial agent since sulfanilamide, has had a curious history since its discovery by Alexander Fleming in 1929. In the decade that followed, there were only a few scattered reports on the striking inhibition that molds have on the growth of bacteria. In 1940, Howard Walter Florey and his associates, spurred by the need for a more effective treatment of infected war wounds, made a successful and dramatic clinical application of penicillin. A year later, the first clinical report on the use of penicillin was made in this country.[1]

The laborious methods necessary to produce the new antibiotic drastically limited the amount available for experimentation, and, for a long time, all supplies were earmarked for military use. Only in the last month has commercial production reached the point at which penicillin can be made available to civilians. This increase in availability should lead at once to further experimentation with penicillin for dental uses, a field in which very little positive evidence exists at the present time.

In spite of its amazing potency, penicillin is apparently free from toxicity to a marked degree. The fact remains that little is yet known about its ultimate toxicity and that it may be years before all of its disadvantages in this respect are fully understood. In the current view, the effectiveness of penicillin is very great in comparison with its hazard.

Penicillin apparently has its primary effect by inhibiting the reproduction of susceptible organisms. The sulfonamides, on the other hand, cause a reduction

1. Smith, A. E.: Present Status of Penicillin. J.A.D.A., 31:790, June 1, 1944.

in the rate of growth of the bacteria. Unlike the sulfonamides, penicillin is not inhibited in the presence of pus or tissue fluids. It is most effective in infections due to staphylococci sensitive to it, with or without bacteremia, to hemolytic and anaerobic streptococci, clostridia, pneumococci, gonococci and meningococci. It is also effective in early and late syphilis.[2] Penicillin, therefore, can be useful in dentistry as an adjunct of surgical procedures in the treatment of certain serious infections of the oral cavity.[3]

Several investigators have asserted that penicillin is useful in the treatment of Vincent's infection of the mouth,[4, 5, 6] but most studies thus far have lacked adequate controls. There has also been no conclusive evidence that penicillin therapy produces more than a temporary remission of symptoms, and the classic manipulative procedures of dentistry must still be relied upon to bring about a cure in conjunction with proper home care. This limited action of penicillin is not surprising in view of the known character of Vincent's infection. Apparently, the bacteria associated with the disease are not the primary cause, and therefore eradication of the bacteria alone would not be expected to effect a permanent cure.

It may be that further investigation will reveal more valuable and widespread uses for penicillin in dentistry as its properties are so unusual that it may succeed where others have failed. Uninformed enthusiasm and a desire to exploit the novel should not be substituted for the rational use of penicillin in dentistry, and such use must await the outcome of controlled investigation and research.

DENTAL EDUCATION IN THE NORTHWEST

The cause of dental education in the Northwest has recently been notably advanced by action of the legislatures of the states of Washington and Oregon. In Washington, more than $4,000,000 dollars has been appropriated for the erection, equipment and maintenance of new schools of dentistry and medicine. In Oregon, the University of Oregon, by action of the state legislature, has accepted title to the properties of the North Pacific College of Oregon. After July 1, the Oregon State System of Higher Education will take over operation of the school.[1]

These actions have a dual importance. They indicate the interest of the profession and of the citizens of the Northwest in insuring for their communities a continuing supply of well-qualified dentists. They also indicate a sympathy with the program of the Council on Dental Education of the American Dental Association, which has insisted that the dental school function is an integral part of an accredited university. In all but one of the thirty-nine dental schools of the country, such an association with a university or a medical school has now been accomplished.

The dentists of the Northwest have been leaders in these efforts to advance dental education. An unusual chance to continue that work in the proper direction has been granted in Oregon with the establishment of an advisory council of five memfrom the Oregon State Dental Association. This council, which will be appointed

2. Smith, A. E.: Penicillin Progress. J.A.D.A., 31:1379, Oct. 1, 1944.
3. Council on Dental Therapeutics. Penicillin and Related Compounds. J.A.D.A., 32:355, March 1, 1945.
4. See p. 529.
5. See p. 538.
6. See p. 551.
1. J.A.D.A., 32:521-522, April 15, 1945.

by the governor, has a unique opportunity to work out an effective relation between university officials and organized dentistry. Such a relation, on an official and permanent basis, cannot but reflect itself in improved standards of dental education.

THE EDUCATION OF DENTISTS IN WARTIME

The handling of dental education by the armed forces during this war has not been a happier experiment than it was in the last. The "awkward blunders" of the administration of the Students' Army Training Corps in World War I have been repeated in large part during World War II. This possibility was foreseen as early as May, 1943 by THE JOURNAL, which then pointed out the dangers.

> . . . It seems unbelievable, but it is the sober fact, that Army and Navy officials would lay out plans for taking over dental education, reorganize and greatly modify the predental requirements and set the stage for regimentation of the dental schools without even recognizing the existence of the two agencies principally responsible for the present conduct and status of dental education.
>
> After all this military machinery does its work, it will transpire, we predict, that there was really no occasion or necessity for doing anything. What more do the Army and Navy want than a steady flow of well-trained dentists to meet their replacement needs? . . . Allowed to carry on their work undisturbed, the schools would have continued to enroll new classes on the present basis of admission and number with completely accelerated schedules and with the assurance that the reasonable and tremendously important needs of the civilian population and the literal demands of the Army and the Navy would be met. All the Government needed to do was to establish a sensible working scheme for the deferment of enough bona fide high school and liberal arts college students to sustain the present enrollment in dental schools. . . .[1]

Government evaded this simple solution, however, to work out the more complex plan represented by the Army Specialized Training Program and the V-12 program of the Navy. The former displayed little durability and was precipitously abandoned by its sponsors, who permitted the discharge into civilian life of approximately 250 young dentists who had been trained and maintained at government expense. Although a majority of these men ultimately found their way into uniform, this spectacle did not amuse the thousands of older dentists who had left established homes, families and practices to serve their country in a time of need. The cry of the time was for younger men of combat age, yet this arbitrary program of army officials worked directly to frustrate that need.

The Navy V-12 program, which takes in a lesser number of students, has fared better and has displayed less of the characteristic military tendency to improvise in situations that are better served by intelligent, long-range planning.

Today, there are still many dental students who have had some of their training subsidized by government and who wish to enter the armed forces. They are prevented from doing so in many instances by Army and Navy regulations governing the number of officers in the Dental Corps. It is exceedingly difficult to understand why these younger men should not be permitted to enter the armed services to replace older men on a basis of (1) length of service, (2) health, (3) age and (4) dependents. Such simple justice can be the part of any military program, even in time of war.

With all of this fancy tightrope walking through the wartime problems of dental education, there is still no program for keeping a sufficient number of young men

1. Editorial, J.A.D.A., 30:748, May 1, 1943.

in the dental schools of the country to provide for future needs. Under the present program, for which Selective Service must bear its share of responsibility, there will be a critical shortage of dentists after 1948, simply because the existing capacity of the country's dental schools cannot be used.

Senator Ellender has recognized this potential crisis and has introduced into the Senate a bill (S. 637)[2] to defer or release from active service not more than 3,500 predental students and not more than 1,750 dental students for each year of the training course. The objectives of this bill were endorsed as early as 1943 by the American Association of Dental Schools and by the Council on Dental Education and the Ad Interim Committee of the Board of Trustees of the American Dental Association.

The Ellender bill also has similar provisions for premedical and medical students. It is to be hoped that with the support of both professions, the basic provisions of this bill will soon be enacted into legislation. Dental societies and dental schools should do everything in their power to urge its passage, in order to prevent a critical shortage of health profession personnel in the years immediately to follow.

EXPOSED PULPS AS A PORTAL FOR POLIOMYELITIS

The exact route by which the poliomyelitis virus enters the human body has not yet been determined beyond scientific question. The olfactory lobes and the gastrointestinal tract have both been suggested as possible portals of entry, but supporting data are not entirely conclusive. It is known, however, that the virus travels along nerve pathways. Aisenberg and Grubb, in this issue of THE JOURNAL,[1] advance the interesting proposal that the exposed pulps of teeth, with their rich ennervation, may provide additional portals of entry for this disease.

Earlier, Aisenberg and Grubb[2] had shown that paralytic poliomyelitis could be produced by inoculating the pulps of teeth of monkeys with the virus. They then set out to demonstrate that the virus could enter the body through an exposed pulp and travel, via the maxillary and mandibular branches of the fifth nerve, to the semilumar ganglion. Of five monkeys thus inoculated, only one showed unmistakable signs of paralysis, but all of the four remaining gave definite pathologic evidence of the infection in the spinal cords on section.

The investigators then examined four groups of children, who were divided into poliomyelitis and nonpoliomyelitis cases, to observe any correlation between pulpal exposure and the presence or absence of the disease. In one group of 272 North Carolina children with poliomyelitis, 190, or 69.85 per cent, gave evidence of pulpal exposure; while, in a group of 286 children without poliomyelitis, only 77, or 26.92 per cent, had exposed pulps. In another study, of 103 Baltimore children with poliomyelitis, sixty-seven, or 65.04 per cent, were found to have pulpal exposures; while, in the control group of 108 children without poliomyelitis, only twenty-six, or 24.07 per cent, suffered from pulpal exposure.

These margains of difference would appear to be too substantial to be attributed entirely to chance. They seem to indicate that the exposed pulps of teeth constitute another possible portal of entry for the disease, a portal that can be closed quite readily by proper dental measures. Additional studies will have to be conducted

2. For text of bill, see J.A.D.A., 32:490, April 1, 1945.
1. J.A.D.A., 32:555, May 1, 1945.
2. Aisenberg, M. E., and Grubb, T. C.: J. Bact., 46:311, September 1943.

before final evidence is at hand. In the interim, dentists can take suitable precautionary measures by guarding dental portals against this dread disease.

PLANNING FOR THE RETURNING DENTAL OFFICERS

In order to plan intelligently for the needs and desires of dental officers on their return from military service, questionnaires were sent to all dentists in the armed forces by the War Service and Postwar Planning Committee of the American Dental Association in cooperation with the various services. In this issue,* the general findings of this survey are reported and these should be studied by all of those who have a concern with the problems of the returning dental officer.

The questionnaire was distributed among 21,000 commissioned dental officers, and the present report is based on more than 7,500 replies. An analysis of these indicates that a good cross-section of men in the services has been obtained, an important point in determining the validity of the needs and wishes expressed. Only the general findings are presented in this first report. A more specific analysis of individual problems will be presented in the remaining articles of this series.

Many of the findings are not unexpected, but others indicate new and, perhaps, significant trends: 90 per cent of the dental officers want to engage in private practice after their separation from service, but only 62 per cent want to return to their former communities to practice. More dentists will seek practices in cities between 5,000 and 100,000, than in the largest cities and smallest towns. Twenty-five per cent of dentists would like to become associated with other dentists in a group practice, and 28 per cent would be willing to establish themselves in needy areas if aid of some kind were provided. Seventy per cent of those replying desire some kind of postwar training and an additional 8 per cent express an interest in such training. More than half of the dentists will need some equipment in order to return to or establish themselves in practice.

These figures will be of great value to dental societies that have an interest in (1) the problems of the returning dental officer and (2) the problems of providing more dental care in all parts of their areas of influence.

THE CENTENARY OF WILHELM KONRAD ROENTGEN

It is ironic that, in the midst of the greatest conflict of all time, scientists should pause in their search for war-useful knowledge to observe the centenary of the birth of Wilhelm Konrad Roentgen, the man who gave eyes to science through his discovery of the x-rays. In the year of discovery, 1895, exactly a half century ago, the x-rays were a scientific toy. Today, they have indispensable usefulness, not only in medicine and dentistry, but also in many other fields of science and industry.

Discovery owes a peculiar debt to Roentgen because it was his discovery that made possible a new and more significant relation between dental practice and the biologic sciences. The application of the x-rays in dentistry taught the unforgettable lesson that dental and oral structures are an integral part of the human body. To Roentgen, therefore, and to his accidental discovery is due much of the progress that dentistry has made in advancing from a mechanical craft to an authentic, health service profession.

*See p. 568.

ASSOCIATION ACTIVITIES

ARMY DENTAL CORPS

Assignment of Officers on Return from Overseas

A statement on the assignment of officers of the Army Medical Department on their return from overseas duty has been released by the Military Personnel Division of the Surgeon General's Office. The statement follows*:

Officers now serving overseas in Medical Department activities apparently have a tendency to believe that when returned to the United States under the rotation policy or otherwise they will be immediately placed in a unit earmarked for early movement overseas, or they will remain idle in "pools" for long periods of time, as officers for whom no suitable assignment is available. Such impressions are based on erroneous rumors. The impression regarding pool assignments may be based on a state of affairs which existed earlier in the war wherein Medical Department affiliated units were called to active duty and could not be functionally employed for long periods of time. Officers were assigned to other units which also were not earmarked for immediate active duty in a theater.

The surgeons of all theaters, and through them all technical echelons of the Medical Department, can be assured that this situation does not exist. The Military Personnel Division is making every effort to:

1. Reassign individuals promptly on completion of their leave and subsequent report to a personnel redistribution station (ZI), even to the extent of having orders awaiting them on arrival at such stations.

2. Develop a long-range program of assignments by having immediately available a record of vacancies or planned vacancies in their priority of importance.

3. Replace with returnees from theaters individuals now serving in all types of Medical Department (ZI) activities who are qualified for general military service or limited service overseas.

4. Assign officers to "in service" professional training courses who have been on administrative or nonprofessional duties for twelve months preceding rotation if the military situation will permit. These courses will be available when requested by returnees from overseas.

Three priorities of replacements for rotation of personnel are established by War Department Circular No. 8, 1945: (1) those who have not been overseas; (2) those who have been overseas and returned to the zone of the interior for the longest period of time; (3) all others. Obviously military necessity will govern the execution of these plans, but all concerned should be advised of the Surgeon General's appreciation of the services rendered in the theaters and the War Department's realization of its obligation to the individual.

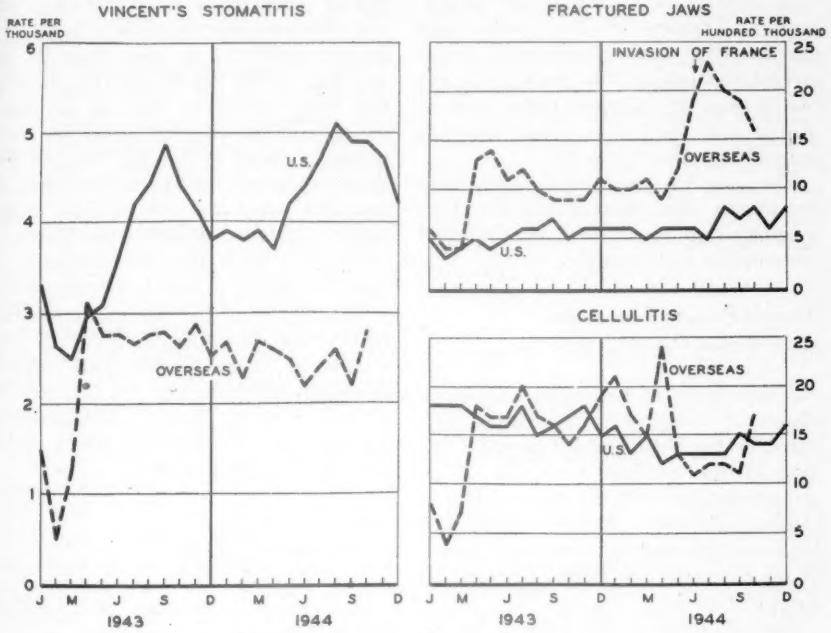
Officers returning to the United States for ordinary leave, emergency leave, temporary duty, or rest and recuperation leave, frequently state that the surgeon of the theater or his representative has stated that they can be reassigned within the zone of the interior if the Surgeon General so desires. This office is not allowed to request the assignment of such individuals except in unusual and emergency cases. In the event that the theater surgeon concurs in the assignment of such officers to the zone of the interior, proper notification of such release should be sent through military channels to the War Department in ample time.

*Bull. U.S.A. M. Dept., 39:86, March 1945.

Promote Eight Dental Officers to Rank of Lieutenant Colonel

The following eight dental officers have been promoted from the rank of major to that of lieutenant colonel: Vincent A. Madda, John D. Rosenfeld, William B. Simms, Merle W. Ogle, Stanley F. Steele, Carl M. Hood, George B. Broadhurst and Irvin J. Aronson.

DENTAL INFECTION AND INJURY PER THOUSAND OR HUNDRED THOUSAND MEN PER MONTH



Dental Infection and Injury Rates Released by Army

The following statement on dental infection and injury rates has been issued by the Dental Division, Surgeon General's Office:

Statement.—Despite its epidemic potentialities, Vincent's stomatitis, or trench mouth, has presented no serious problem during this year. There has been a gradual rise in the rate of admission in the United States since early in 1942, with a peak of 5.2 per thousand per month during August 1944, but the rate has been consistently below the level which might be expected in time of war. Since the sharp rise in March and April 1943, the overseas rate has remained fairly constant at less than 3 per thousand per month. The overseas incidence has been generally higher in areas where troops are in relatively close contact with the civilian population. In this war, there is no evident relationship between combat and the frequency of Vincent's stomatitis.

Fractures.—In contrast, the rate for fractured jaws reflects combat activity to a marked degree. The precipitate increase in jaw fractures overseas for June and July 1944 can be attributed to the invasion of the Continent and also, in some measure, to the hedge type of warfare of the initial phase of the operation.

Cellulitis, a result of dental infection, has been slightly more frequent among overseas troops during 1943 and 1944 than among troops in the continental United States. After its rise to the peak of 24 per hundred thousand men per month in April 1944, the overseas rate has declined again to approximately that

for the continental United States. The two high points in January and April 1944 resulted from increases in the European Theater in the preinvasion months when large numbers of troops arrived in England. The most significant rise among the overseas troops was in March and April 1943, when the rate jumped from about 8 to 18.

The rate for osteomyelitis has been consistently low throughout the war, ranging from 0.5 to 0.8 per hundred thousand men per month.

Army to Prepare Film Strips to Aid Dental Officers

A new series of film strips on various phases of dentistry is now being prepared by the Dental and Training Divisions of the Surgeon General's Office, in conjunction with the Army Medical Museum and the U. S. Signal Corps. The films are intended for study and review by the officers of the Dental Corps at all Army installations.

One of the first film strips to be released will deal with various diseases of the mouth. Other subjects to be covered are dental anomalies, dental caries, periodontal diseases and infections, odontogenic cysts and tumors, and tumors of the oral cavity. The films will provide an additional source of information to many dental officers and will afford an opportunity for group meetings and discussions.

Maxillofacial Injuries in African and Sicilian Campaigns

A survey of the North African and Sicilian campaigns, made by the Dental Division, Surgeon General's Office, shows that of the total admissions to hospitals, 0.5 per cent were for maxillofacial injuries. There were actually 342 maxillofacial cases, and 145, or 42 per cent, of the total number were the result of battle casualties, while 197, or 58 per cent, of cases were the result of accidents.

The incidence of maxillofacial injuries as compared to all battle casualties was about 2.2 per cent. Two facts may be responsible for a lower rate in this war than in the last World War, namely that there has been little or no static trench warfare wherein the soldier must expose his head to fire, and that the velocity of modern missiles causes a greater mortality when the face or head is hit. In the 342 cases studied in the hospitals, there were no deaths due primarily to battle incurred maxillofacial injury.

The history of the European Theater reveals that from September 1 to December 31, 1944 maxillofacial injuries averaged approximately 5.9 per cent of all wounds in the theater, and that about 3.4 per cent of the total deaths result from this type of wound.

Changes of Assignment in Army Dental Corps

Col. Terry P. Bull has relieved Col. Oscar P. Snyder as Theater Dental Surgeon, South West Pacific Theater. Colonel Snyder has been assigned as Chief of Dental Service, England General Hospital, Atlantic City. Col. Frederick R. Wunderlich has replaced Colonel Bull as Service Command Dental Surgeon of the 7th Service Command with headquarters in Omaha.

Col. Campbell H. Glascock has been assigned to duty with the Port Surgeon's Office, New York Port of Embarkation. Col. Boyd L. Smith has been assigned as chief of dental service, Letterman General Hospital, San Francisco. Col. Lester C. Ogg has been assigned as post dental surgeon, Fort Sill, Okla.; Col. William B. Stewart, as camp dental surgeon, Camp Barkeley, Texas, and Col. John S. Ross, as camp dental surgeon, Camp Claiborne, La.

Lt. Col. Brice M. Dorsey, head of the Department of Oral Surgery, University of Maryland, who has been on duty in

Australia, is now on temporary duty in this country. He has been assigned temporarily to the Dental Division, Surgeon General's Office, to aid in the revision of film strips dealing with maxillofacial casualties.

Ratio of Dental Officers in Foreign War Theaters

A ratio of one Army dental officer to every 830 troops existed in the Southwest Pacific Theater during the last quarter of 1944, according to a recent announcement from the Dental Division, Office of the Surgeon General. At the first of the year, 109 dental officers had been evacuated to the United States for physical reasons, seventy had been returned under a rotation policy, two had been released from active duty, two had been killed in action and two were missing on noncombat missions.

Mediterranean Theater.—The ratio of dental officers in the Mediterranean Theater, which includes Italy and North Africa, varied during 1934 from 1:833 to 1:939. The average ratio has been one dental officer for every 850 men.

Badge Authorized for Members of Army Medical Department

A medical badge, in recognition of the service rendered during combat by the members of the Medical Department assigned or attached to the Infantry, has been authorized by the War Department.

The badge is of silver metal, elliptical, with the Medical Department's insignia, the Caduceus, and the Geneva Cross superimposed on a litter surrounded by a wreath of oak leaves. It is to be worn on the left breast above decorations and service ribbons.

It will be awarded to Medical Department personnel regularly assigned or temporarily attached during combat to the medical detachments of infantry regiments, battalions or elements thereof since December 7, 1941. Enlisted and officer personnel below field grade (major) are eligible for the badge. It may be awarded to the regimental surgeon regardless of rank.

The regimental commander is authorized to make the award for "satisfactory performance of duty under actual combat conditions." Also he is given the power to withdraw the badge if the individual fails to perform his duty satisfactorily.

COUNCIL ON DENTAL HEALTH

Council Reports on Recent Meeting Held in Chicago

Municipalities having health departments that are not under the jurisdiction of the state health department should seek the establishment of a separate dental division, with a dentist as director, in order to develop organized dental programs at that level. This recommendation was made by the Council on Dental Health, which held a three-day meeting in Chicago, February 10-12. The Council also considered a number of special problems, which are reported in a summary prepared by Allen O. Gruebbel, secretary.

Health Care.—After giving careful consideration to the important elements to be included in federal dental health education and dental care bills, the Council submitted several recommendations to the Committee on Legislation, to serve as a guide in preparing the final form of the bill.

Dental Divisions.—The Council voted to call to the attention of the state societies a recommendation passed by the House of Delegates in 1937. This action recommended the establishment of dental divisions in state health departments, the appointment of a trained

and qualified dentist as director and the appointment of dentists as members of state boards of health. The Council, in calling attention to this recommendation, recognized the need for an expansion of local dental health programs and anticipated an increase in facilities for carrying out dental health activities under the administration of official health agencies.

The Council also urged municipalities that have health departments not under the jurisdiction of the state department of health to seek to have established separate dental divisions with a dentist as director.

Research.—The Council also assigned to the Research Committee the task of defining the term "compulsory health insurance" more satisfactorily, of determining the cost of complete dental service to child and adult groups in cooperation with the Committee on Economics and of investigating the facilities needed for increasing the number of negro dental students so that proper action may be taken on this important problem.

Children's Programs.—In view of the fact that dental health programs are being directed primarily toward children, the Council agreed to call attention to the urgent need for placing more emphasis on dental care for children and on the consideration of dental public health problems in the dental colleges.

Physical Fitness.—The Council's Physical Fitness Committee was authorized to appoint a representative from the National Parent-Teacher's Association and one from the Academy of Pediatrics as consultants.

Public Relations.—In view of the growing public interest in dental health and the many complex problems involved in public relations, the Council voted that all publicity concerning the Association's affairs, activities, policies and programs should emanate from, and carry the name of, the American Dental Association.

Educational Material.—The Council voted to approve a program under which there would be close cooperation between the Council and the Council on Dental Therapeutics in examining educational material submitted by various agencies.

State and local councils on dental health will be kept informed of the activities of all councils through a monthly news letter to be issued by the Council on Dental Health.

Methods of Payment.—The Council voted to accept a recommendation of the Methods of Payment Committee on the development of a postpayment plan. This plan would embody the principles that will provide dental society control and will protect the public's and the profession's interest. The plan is to be made available in pamphlet form.

The committee was also authorized to investigate the possibility of securing underwriting funds for experimental prepayment plans and to obtain information from state dental health directors relative to the practicability and effectiveness of the dental care plan for low income groups.

States' Relations.—The Council requested the Board of Trustees to institute proper action to clarify the official relations among national, state and local societies, particularly with respect to the planning of dental health service programs both on a state and on a local level.

Consultants.—The Council devoted considerable discussion to the problem of encouraging governmental agencies to include official representatives of the American Dental Association in conference dealing with dental matters. Definite action was postponed until further study could be made of the procedures that are employed by governmental agencies in the appointing of dental consultants.

COUNCIL ON DENTAL THERAPEUTICS

Council on Dental Therapeutics Reports on Present Status of Complex Ointments or Packs Containing Sulfonamides

The Council on Dental Therapeutics has authorized publication of the following report.—*Donald A. Wallace, Secretary.*

Report.—Some time ago, Abbott Lab-Laboratories of North Chicago, Illinois, submitted Sulfapac for consideration by the Council on Dental Therapeutics. At the annual meeting of the Council in February 1944, it was voted not to accept Sulfapac. Since that time, the Council has continued its study of preparations of this type and a report to the dental profession now seems indicated.

Sulfapac-Abbott is said to have the following composition:

Sulfathiazole	60%
Acacia powder	6%
Glycerin	30.977%
Benzyl alcohol	3%
Metaphen	0.023%

In considering this preparation, the following three questions have seemed to the Council to be of great importance: 1. Is there danger of systemic or local toxic reactions from the use of this preparation in the extraction socket? 2. Is the preparation an effective therapeutic agent? 3. Since the preparation is a combination of several well-known drugs, is there sufficient evidence of its superiority over less complex means of supplying the sulfonamides, and, further, do existing data clearly indicate its effectiveness to be a property of the sulfathiazole content or may other of its ingredients be equally or more effective?

The firm has not submitted adequate evidence that Sulfapac is self-sterilizing under conditions of actual use. The product is marketed in a wide-mouth jar and must be removed by an instrument. The possibilities as to contamination of the preparation with a wide variety of pathogenic organisms are obvious.

Consideration of this product has been made difficult by the dearth of controlled data available as to its safety and effectiveness as compared with other means of supplying the sulfonamides. Both the known pharmacologic characteristics of the individual ingredients and the available controlled data on the product itself have been carefully weighed in the Council's study.

From the standpoint of safety, there seems little possibility of systemic reaction and none has been reported in the limited data available. It has been pointed out that contact with sulfathiazole, acacia or glycerin is capable of causing local irritation and therefore potentially capable of causing a delay in the healing of extraction sockets. Several investigators, including Bick,[1] Taylor,[2] Glynn[3] and Krashen,[4] have recently called attention to the local irritant properties of the sulfonamides and, as a result, there has been a tendency to use them in smaller quantities in open wounds. New and Nonofficial Remedies 1944[5] suggests that not to exceed 0.1 gm. per square inch of wound surface should be used. Furthermore, it is well-known that acacia is toxic to the liver cells and red blood corpuscles when used intravenously.[6] Obviously, there would be no chance of absorption of a

1. Bick, E. M.: J.A.M.A., 118:511, February 14, 1942.
2. Taylor, F. W.: J.A.M.A., 118:959, March 21, 1942.
3. Glynn, L. E.: J. Path. & Bact., 53:182, September 1941.
4. Krashen, A. S.: Local Use of Sulfonamides. J.A.D.A., 29:1427, August 1, 1942.
5. New and Nonofficial Remedies. Chicago: American Medical Association, 1944, p. 178.
6. Sollman, T. H.: Manual of Pharmacology. Philadelphia: W. B. Saunders Co., 1942, p. 899.

	Control	Medicated and Unmedicated Gauze Dressings	Sterile Petrolatum	60% Sulfathiazole in Petrolatum	60% Sulfathiazole in Glycerin base*
Total extractions	304	149	237	222	397
Dry sockets	51	5	20	13	11
Dry sockets (per cent)	16.8	3.4	8.4	5.9	2.8

*This preparation is stated by Abbott Laboratories to have been Sulfapac.

sufficient amount of acacia to produce these conditions in the blood stream, but the question remains as to what effect it might have on the blood clot and delicate proliferating cells of the healing socket. The mild irritant qualities of glycerin are also well known.[7] Thus, the Council is in doubt as to the advisability of routinely packing extraction sockets solidly with a preparation the three principal ingredients of which, making up 97 per cent of its weight, have known irritant properties. It should be emphasized that presently published data do not show that the use of Sulfapac will retard the healing of an extraction socket, but neither do available data clearly show that it will not, and the Council is reluctant to accept it until this point is satisfactorily clarified.

Perhaps the best available data as to effectiveness are to be found in a recent article by Millhon *et al.*[8] Space will not permit a complete review of this article, but the pertinent data as regards this type of sulfonamide preparation are summarized in the accompanying table.

The evidence is rather obviously indicative of the effectiveness of Sulfapac since the incidence of dry socket was reduced from 16.8 per cent in the control group to 2.8 per cent in the sockets treated with Sulfapac. On close analysis, it is apparent that several pertinent questions remain unanswered by this study.

First, there is the question of the relative merits of the sulfathiazole as compared with the metaphen and benzyl alcohol which the preparation contains. Metaphen is known to be a stronger antiseptic agent than sulfathiazole, and one necessarily wonders what the results would be with a similar ointment minus the sulfathiazole.

Obviously, this question is not answered by this study; nor is the question as to the relative merits of dusting the sockets with sterilized crystalline sulfathiazole or using sulfathiazole in a simple ointment base or in a paste with glycerin that could be prepared extemporaneously at the chair. As a matter of fact, the authors express a preference for crystalline sulfathiazole via a powder atomizer in upper impactions, alveolectomies and cystic cavities. The use of a simple 60 per cent sulfathiazole in petrolatum ointment is seen to have reduced the incidence of dry socket from 16.8 per cent in the control series to 5.9 per cent, and yet it is well-known that petrolatum is a poor ointment base for sulfonamides and that their effectiveness is markedly reduced when thus used.

Furthermore, the fact that the incidence of dry socket was only 0.6 per cent greater when medicated and unmedicated gauze dressings were used as

7. Reference 6, p. 120.

8. Millhon, J. A., et al.: Evaluation of Sulfa Drug and Other Dressings in "Dry Socket" in Lower Third Molars. J.A.D.A., 30:1839-1844, December 1, 1943.

compared with the series in which Sulfapac was used, casts still further doubt on the role that the sulfathiazole played. The authors discuss this point and suggest that an important factor in the prevention of dry sockets by any dressing is the reduction of the size of the clot in the socket so that ". . . the nutritive requirement from the blood in the surrounding bone is such that it can be met adequately." In short, we are left in doubt as to whether the reduction in the incidence of dry socket was a function of the sulfathiazole or merely a result of a mechanical reduction in size of the clot. If the latter mode of action were found to be true, the premise upon which Sulfapac is named, advertised and sold to the dental profession would be in error.

The Council on Dental Therapeutics has always taken the position that any mixture of drugs must present a clear-cut advantage over its individual active ingredients, to be acceptable for A.D.R. This attitude is expressed in the Council's Official Rules as follows: "The Council endorses the principle that pharmaceutical mixtures should be prescribed and used on the basis of therapeutic effects of the individual ingredients. For this reason, it includes in this list only those mixtures that present some real advantage."

Since the use of complex ointments or packs containing sulfonamides is not supported by adequate available evidence, the Council finds Sulfapac not acceptable for A.D.R. The Council will continue to consider any controlled evidence which may be presented on behalf of this group of products.

Notice of Judgment Under U. S. Food, Drug and Cosmetic Act

The following notice of judgment under the Federal Food, Drug and Cosmetic Act was issued in March 1945.

1047. Misbranding of Pyrozide Tooth Powder. U. S. v. 282 Packages of Pyrozide Tooth Powder. Consent decree of condemnation. Product ordered delivered to a charitable institution. (F.D.C. No. 89-2. Sample Nos. 18812-F, 18813-F.)

Examination of this product showed that it consisted essentially of calcium carbonate with smaller quantities of magnesium carbonate, powdered cinchona bark, salicylic acid, soap and flavoring materials. It was short of the declared weight.

On or about November 30, 1942, the United States attorney for the Southern District of New York filed a libel against 282 packages of Pyrozide Tooth Powder at New York, N. Y., alleging that the article had been shipped on or about August 3 and October 22, 1942, by the Web Distributing Co., from Newark, N. J., and charging that it was misbranded.

It was alleged to be misbranded in that the statements appearing in its labeling which represented and suggested that it was effective in the treatment of pyorrhea, gingivitis, trench mouth and all other diseases of the oral tissue were false and misleading, since the article was not effective in the treatment of those diseases, and in that it was in package form and its label failed to bear an accurate statement of the quantity of the contents.

On June 25, 1943, the Web Distributing Co., claimant, having consented to the entry of a decree, judgment of condemnation was entered and it was ordered that the product be delivered for the use of a charitable institution and that costs be assessed against the claimant.

Council Offers List of "Accepted Dentifrices"

A list of "accepted dentifrices" that are readily available in all parts of the country has been prepared for distribution by the Council on Dental Therapeutics. Special lists have been prepared for various sections so that all of the accepted dentifrices available in that area are given. In addition, the list indicates stores and other agencies where accepted dentifrices can be purchased by the public. The list will be furnished free on request to the Council, 222 E. Superior St., Chicago 11, Ill.

WAR SERVICE COMMITTEE

Veteran Dental Officers to Get Preference on Surplus Property

Very small amounts of suitable dental equipment and supplies have been declared surplus by the armed services to date. According to the War Service Committee of the American Dental Association, the Surplus Property Board is now considering ways and means of giving preference to veteran dental officers and the board has promised cooperation with the committee when regulations are formulated.

The War Service and Postwar Planning Committee has already announced its approval of a system of priorities under which the returning dental officer will have the first opportunity to purchase surplus dental equipment.

Dental officers who have returned to civilian life can now obtain priorities in the purchase of needed equipment from manufacturers. A photostatic copy of the "discharge from service" should be included with the order, and the manufacturers have agreed to fill these particular orders as soon as possible. The orders will be given preference over the orders of civilian dentists.

Army, Navy and Public Health Service Approve War Memorial

The Army, the Navy and the Public Health Service have expressed their approval of the American Dental Association's proposal to erect a suitable war memorial to honor all dental officers dying in this or in other wars. The War Service and Postwar Planning Committee is now engaged in a survey to determine the type and location of a suitable memorial.

Maj. Gen. George F. Lull, Deputy Surgeon General of the Army, in approving the project, said: "The inauguration of such a worthy program on the part of the American Dental Association is not only timely, but it is most significant and commendable. I feel privileged to endorse this program and I shall lend every encouragement to the end that a suitable memorial may be erected for those officers of the Dental Corps who have contributed so much to the victory that is ours."

Surg. Gen. Thomas Parran, United States Public Health Service, also commended the project: "I heartily endorse the resolution and I am sure the dental officers of the U. S. Public Health Service will give their fullest cooperation to any program the War Service and Postwar Planning Committee may initiate to finance the erection of a suitable memorial."

Vice Adm. Ross T. McIntire, Surgeon General of the Navy, said "I think your plan is worthy and you can count on the Navy's cooperation."

Selective Service Rules on Deferment Are Revised

The following revision of the policies concerning deferment has been issued by the National Selective Service System.

The National Headquarters of Selective Service, in an amendment of Local Board Memorandum No. 115, has revised the procedures relative to the deferment of men under 38 years of age and has designated the Procurement and Assignment Service as one of the fifteen certifying agencies, with the Code No. 15. These procedures will affect (*a*) civilian interns, (*b*) civilian residents, (*c*) members of the professions on the faculties of universities and (*d*) members of the professions engaged in private practice or otherwise regularly engaged in an activity in war production or in support of the national health, safety or interest.

Age Group 18 Through 29.—A. It is necessary at once for state chairmen to ask employers (universities, hospitals, industries and so on) to make out and submit to the state chairman's office a list, in triplicate, of members of the professions in his establishment who are in the age group 18 through

29 and who are necessary to and regularly engaged in and are indispensable and irreplaceable in an activity in war production or in support of the national health, safety or interest. This includes all those who were on Jan. 1, 1945 classified II-A or II-B. Two sets of three copies each of form 42-A (special-revised) should be submitted for each registrant.

B. Immediately on receipt of forms 42-A (special-revised) the state chairman should, if he concurs that the registrant is essential, (1) certify by signing the originals only and entering the name and Code No. 15 of the Procurement and Assignment Service as the certifying agency; (2) forward one complete set of three copies each of form 42-A (special-revised) to the registrant's local board; (3) forward to the state director of Selective Service in the state of employment the original copy of the second sheet of 42-A (special-revised), with one copy of the lists, and (4) retain, for his own use, two carbon copies of form 42-A (special-revised) and the two copies of the lists.

Age Group 30 Through 33.—The same procedure as outlined in A and B will be followed by members of the professions in the age group 30 through 33, with the exception that forms 42 and 42-A will be used in place of form 42-A (special-revised). Members of the professions in the age group 30 through 33 must be necessary to and regularly engaged in (but not necessarily indispensable and irreplaceable in) an activity in war production or in support of the national health, safety or interest.

Age Group 34 Through 37.—The same procedures as outlined in A and B will be followed for members of the professions in the age group 34 through 37, with the exception that forms 42 and 42-A will be used in place of forms 42-A (special-revised). Members of the professions in the age group 34 through 37 must be regularly engaged in (but neither necessary to nor indispensable and irreplaceable in) an activity in war production or in the support of the national health, safety or interest.

N. B.: 1. The term "interns" as used includes all individuals serving in internships whether or not they have received their degree of doctor of medicine.

2. These procedures are not necessary for individuals who are classified by Selective Service as 4-F. However, this must not be confused with a physical disqualification on application for commission, which is an entirely different thing.

3. Students are not included in these procedures.

NAVAL DENTAL CORPS

Navy Develops Exhibit on Maxillofacial Injuries

A permanent exhibit on oral diseases and maxillofacial injuries in naval hospitals may be shown throughout the country at staff Naval Dental Corps meetings in medical department facilities and at meetings of dental societies. The exhibit was collected, designed and constructed by Cmdr. S. S. Wald (DC) USNR, at the U. S. Naval Hospital, Brooklyn, with the cooperation of Capt. G. E. Robertson (MC) USN, medical officer in command. The exhibit consists of transparency boxes measuring 5 feet high and 3 feet wide. On the inclined sides are mounted series of 5 by 7 inch pictures in color taken by Commander Wald which illustrate procedures used in treating oral diseases and maxillofacial injuries.

Chief of British Naval Dental Corps Makes U. S. Visit

Surg. Rear Adm. E. E. Fletcher, chief of the Royal Navy Dental Corps, arrived in this country April 6 to visit various dental centers and naval installations. His itinerary includes New York, Washington, Annapolis, Chicago and Ottawa. Surg. Lt. Cmdr. Kenneth Fletcher, Royal Navy Dental Corps, son of the admiral, who has been on duty in this country for some time, will accompany his father on some of the tours of inspection. Admiral Fletcher visited Chicago April 16 and made a tour of the Central Offices of the American Dental Association. After a short trip to Canada, he returned to New York.

COMMITTEE ON ECONOMICS

Status of Dental Service and Internships in Hospitals Reviewed by A.D.A. Committee on Economics

The Committee on Economics has issued the following report on the status of dental service and internships in hospitals through Leslie M. FitzGerald, chairman, and Joseph E. Bagdonas, secretary.

SINCE the publication by the Committee on Economics of an extensive report on dental internships and residencies in the January 1941 issue of THE JOURNAL, numerous requests have been received from dentists as well as dental students for additional and later information. Their desire for employment and training opportunities is, however, but one reflection of the growing interest of the dental profession in all ramifications of the field of hospital dental service. Professional groups are concerning themselves with a number of aspects of this field, including the relationship of Dentistry and Medicine in the hospital, the development of community dental services in hospital dental clinics and the establishment of standards for dental internships and hospital dental facilities. At the present time, two groups within the American Dental Association are working on related projects in this field. A committee of the Council on Dental Education is studying the problem of dental internship standards, while the American Dental Association House of Delegates at its recent Annual Meeting approved the formation of a special committee on hospital dental service to set up minimum standards for dental departments in hospitals and to establish an approved list.

In view of this interest, the Committee on Economics presents this summary report on a survey made in 1943 of dental services in the hospitals and related institutions in this country. As in a former instance, arrangements were made with H. G. Weiskotten, secretary of the Council on Medical Education and Hospitals of the American Medical Association, to include a number of questions on dental facilities in the council's annual questionnaire to all hospitals. These institutions were requested to report the employment of salaried dentists and hygienists and provision for dental internships, as well as provision of dental service under other arrangements. This information has been tabulated and is summarized in this report.

A total of 1,678 nonmilitary hospitals in the United States and its possessions reported provision for some type of dental service. In addition, 224 related institutions reported arrangements for dental service. Included in the hospital classification were seventy-four Veterans Administration facilities. For reasons of security, it was impossible to obtain a full report on the dental facilities of all Army and

TABLE 1.—NUMBER OF HOSPITALS AND RELATED INSTITUTIONS IN U. S. AND POSSESSIONS EMPLOYING GIVEN TYPES OF DENTAL PERSONNEL, AND NUMBER OF PERSONNEL EMPLOYED, 1943

Personnel	Number of Establishments*			Number of Personnel		
	Total	Hospitals	Related Institutions	Total	Hospitals	Related Institutions
Total	1,902	1,678	224	5,143	4,784	359
Salaried dentists	656	553	103	884	771	113
Other dentists	906	848	58	2,946	2,846	100
Dental interns	109	103	6	172	166	6
Dental hygienists	903	776	127	1,141	1,001	140

*Columns do not add up to the totals given, since many hospitals employed more than one type of dental personnel.

Navy establishments. At the end of 1942, there were more than 200 military and naval hospitals employing dental personnel. Since there were 6,345 registered hospitals reported in that year by the American Medical Association, 26.4 per cent, or just one plus hospitals in four, had some type of dental service.

In all, 656 hospitals and related institutions employed a total of 884 dentists on a salary basis. While some dentists were engaged in hospital service in every state, one-third of all salaried dentists were employed by establishments in four states: California, Illinois, New York and Pennsylvania. The distribution of hospitals employing salaried dentists is shown in Table 2. In addition, 2,946 dentists worked at 906 hospitals under various other arrangements. Almost one-half of all visiting dentists worked at hospitals in the states of California, Illinois, Massachusetts, New York, Ohio and Pennsylvania. More than 1,900 of the 2,946 visiting dentists provided service at 639 hospitals and related institutions that had no other dental personnel.

A total of 164 institutions reported provision for 274 dental interns; 109 institutions reported a total of 172 dental interns on duty. The distribution of dental internships by states is shown in Table 3. A review of the questionnaires revealed some underreporting by hospitals of provision for internships as against internships occupied. When these items were adjusted, it was found there were at least fifty-four additional positions, bringing the total number of internships available to 331. The largest percentage of hospitals, 79.8, had only one intern serving; 11.0 per cent had two; 2.8 per cent had three or four, while 6.4 per cent had more than four interns in service.

Slightly less than half of the hospitals and related institutions covered in this survey employed dental hygienists. A total of 360 organizations employed 443 hygienists as the only personnel rendering dental service. An additional 277 hygienists served part or full time at 113 institutions also having the services of visiting dentists.

The Committee on Economics has available in booklet form a list of the nonmilitary hospitals in the United States and its possesions employing salaried dentists and interns. This list is available on written request to the Committee on Economics, American Dental

TABLE 2.—DISTRIBUTION OF HOSPITALS AND RELATED INSTITUTIONS EMPLOYING SALARIED DENTISTS, BY STATES AND POSSESSIONS (1943)

State	Number of Hospitals	Number of Dentists
Total	656	884
Alabama	6	8
Arizona	6	25
Arkansas	6	7
California	42	70
Colorado	10	14
Connecticut	15	16
Delaware	2	2
District of Columbia	8	10
Florida	8	13
Georgia	11	14
Idaho	5	6
Illinois	31	62
Indiana	12	13
Iowa	12	15
Kansas	6	6
Kentucky	8	11
Louisiana	7	9
Maine	6	7
Maryland	10	12
Massachusetts	36	39
Michigan	26	36
Minnesota	18	30
Mississippi	4	5
Missouri	21	26
Montana	2	2
Nebraska	3	3
Nevada	1	1
New Hampshire	1	1
New Jersey	31	32
New Mexico	7	7
New York	74	114
North Carolina	5	6
North Dakota	6	6
Ohio	27	36
Oklahoma	14	15
Oregon	4	5
Pennsylvania	39	50
Rhode Island	4	4
South Carolina	5	7
South Dakota	7	7
Tennessee	11	15
Texas	32	35
Utah	5	5
Vermont	3	3
Virginia	9	10
Washington	10	11
West Virginia	13	15
Wisconsin	15	20
Canal Zone	1	7
Hawaii	4	4
Panama	1	1
Puerto Rico	5	5
Virgin Islands	1	1

TABLE 3.—DISTRIBUTION OF DENTAL INTERNSHIPS BY STATES AND POSSESSIONS (1943)

State	Number of Hospitals with	
	Dental Interns	Provision for Dental Interns
Total	109	164
Alabama	1	1
California	5	5
Colorado	2	0
Connecticut	2	4
District of Columbia	1	5
Florida	1	2
Georgia	3	1
Illinois	3	4
Indiana	2	2
Iowa	0	5
Kansas	1	1
Kentucky	0	1
Louisiana	0	1
Maine	1	0
Maryland	4	5
Massachusetts	5	4
Michigan	2	3
Minnesota	4	3
Mississippi	0	2
Missouri	2	5
Nebraska	1	1
New Jersey	5	7
New York	21	49
Ohio	6	11
Oklahoma	2	2
Oregon	1	1
Pennsylvania	17	25
Rhode Island	0	2
Tennessee	5	3
Texas	4	5
Vermont	2	1
Virginia	1	1
Washington	0	1
West Virginia	2	1
Wisconsin	2	0
Hawaii	1	0

Association, 222 East Superior St., Chicago 11, Ill.

The committee wishes to emphasize, however, that this is by no means an approved list, since standards have not yet been established for dental internships or for dental departments in hospitals. At the present time, both of these subjects are under study by authorized bodies of the Association. In view, however, of the need for information concerning the current status of dental service in hospitals, the committee felt that the release of this information would serve a useful purpose for both members of the profession and groups interested in studying the extent and distribution of such services, and for dental students interested in finding opportunities for such service. In the latter instance, the Committee on Economics suggests that reference be made to the yearly "Hospital Number" of the *Journal of the American Medical Association* for information concerning the status of the hospital according to the standards established by the American Medical Association and the American College of Surgeons, as well as for information on facilities, type of service and type of administrative control. The announcements section of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION regularly carries announcements of available dental internships and residences.

LESLIE M. FITZGERALD, *Chairman*,
J. E. BAGDONAS, *Secretary*.

DENTAL SCHOOLS

Temple University Awards Dean Bear Honorary Degree

Harry Bear, dean of the School of Dentistry, Medical College of Virginia, was awarded an honorary degree of doctor of science by Temple University at the recent commencement exercises of the School of Dentistry. Dr. Bear was also the commencement speaker. One hundred and five seniors received dental degrees, and all but four of these were commissioned as first lieutenants in the Army Dental Corps.

Dr. Bear was presented for the degree by Gerald D. Timmons, dean of Temple Dental School. Robert Livingston Johnson, president of the university, conferred the degree.

Columbia University Alumni to Meet May 24 in New York

The Twentieth Annual Spring Meeting of the Association of Dental Alumni of Columbia University will be held at

the Pennsylvania Hotel, New York City, May 24. Sterling V. Mead, President Elect of the American Dental Association, will be one of the speakers. There will also be a discussion of the recent merger of the dental and medical schools. Plaques will also be presented to H. S. Dunning, William B. Dunning, L. Hartman and L. M. Waugh, former members of the Columbia faculty.

BUREAU OF PUBLIC RELATIONS

Four New Pamphlets Added to Series on Oral Hygiene

Four new pamphlets in the series devoted to the problems of dental and oral hygiene have been issued recently, according to Lon W. Morrey, Director, Bureau of Public Relations. Six of the pamphlets in the series are now appearing in the new format, which was designed to make the dental health message more attractive to the public. Each pamphlet is written by an outstanding authority in a particular field of dentistry.

The four new pamphlets are: "X-Rays and Your Teeth," by A. Porter S. Sweet; "Questions and Answers on the Care of Children's Teeth," by the American Society of Dentistry for Children; "The Why and How of Toothbrushing," by Isador Hirschfeld, and "Dental Caries: Causes, Prevention and Correction," by Basil G. Bibby. All of the pamphlets have been approved by the Public Relations Committee of the Council on Dental Health. Single copies can be obtained for 5 cents on request to the Bureau. There are special prices for quantity lots.

PUBLIC HEALTH

President Proclaims Child Health Day for May 1

May 1 was designated as Child Health Day by an official proclamation of President Roosevelt. The day will be used to inaugurate a nation-wide birth registration campaign under the auspices of the Children's Bureau and the Bureau of the Census.

In his proclamation, the President said: "I call upon the people in each community to use that day as an occasion to impress upon parents the importance of registering the birth of every baby in the United States; and I further urge our citizens to mobilize community resources for the better care of our children so that the growing generation will be strong to mold the peace."

Dental Care Program Asked by Dental Section, A.P.H.A.

A five-point plan for a national program of dental care has been adopted by the Section on Dental Health, American Public Health Association, according to an announcement from J. M. Wisan, chairman. The resolution, which received the unanimous approval of the Governing Council of the Association, was sponsored by the Section on Dental Health. The text of the resolution follows:

Resolution.—*Whereas,* the public health professions have long sought means to develop a program of preventive dental services, and

Whereas, dental surveys almost universally disclose a widespread prevalence of dental disease in the United States, and

Whereas, dental disease was the greatest single factor in rejection among selectees at the beginning of the present world conflict, and

Whereas, the dental problem requires organized group action for its solution as a part of a general medical care program, therefore be it

Resolved that the American Public Health Association endorse and support efforts along the following lines:

1. Research to reduce the incidence of dental disease.

2. Research and demonstration to develop and test administrative procedures designed

to reduce the cost and increase the spread of dental care.

3. Education of the public in the need of early and continuous dental care to prevent an increasing accumulation of dental defects.

4. Development of reparative programs, especially for the younger age groups.

5. Stimulation of health agencies at local, state and federal levels to secure funds and and recruit and train personnel to implement the foregoing program. Be it further

Resolved that the Executive Board of the American Public Health Association institute such measures as may be necessary for obtaining the foregoing objectives.

Wisconsin Approves Use of Fluorides in Water Supplies

The use of one part of sodium fluoride per million parts of water in public water supplies was recommended in a resolution adopted by the Wisconsin State Dental Society at its seventy-fifth annual meeting in Milwaukee, March 19. The text of the resolution follows:

Whereas, we the members of the Wisconsin State Dental Society's Fluorine Committee, convinced that the overwhelming weight of evidence now precludes any doubt that a drinking water supply containing a concentration of one part per million of fluorine, as fluorides, inhibits dental decay; and

Whereas, all evidence shows that the optimum of one part per million of fluorine, as fluorides, in water has produced no untoward results,

We therefore recommend that public water supplies deficient in fluorides have their concentration raised to one part per million of fluorine, as fluorides, to inhibit dental decay, providing that such addition is under dental, medical, engineering and public health control.

New Industrial Dental Unit Established in US.P.H.S.

Under a reorganization of the Industrial Hygiene Division of the United States Public Health Service, industrial dentistry and nursing have been established as separate units. Lyman D. Heacock is chief of the Dental Unit.

WAR HISTORY

Abandon Research Council's Medical History of War

The comprehensive medical history of the war, planned under the auspices of the National Research Council, cannot now be undertaken because the Army has withdrawn its support of that project. A statement recently released says that "although the Surgeon General appreciates very much the unselfish interest and efforts of many patriotic physicians and scientists in the development of the National Research Council program, he has expressed the opinion that it should be radically revised to eliminate all accounts of Medical Department activities in this war, until such experience has been published in the official (War Department) history."

Since it would be impossible at this time to prepare an adequate, well-rounded history without access to Army material, the Research Council now proposes to limit its medical history to a record of the activities of the Division of Medical Sciences during the war period.

The various services and agencies which had expected to participate in the history have been notified of the Council's decision, and the majority of them plan to draft their own histories independently.

Cady Returns to U.S. After UNRRA Mission

Frank C. Cady, U. S. Public Health Service, has returned to the United States after a mission of several months with UNRRA in Europe. He has been assigned to District No. 1 with headquarters in New York City.

ESSAY AND RESEARCH AWARDS

Announce Lord and Chaim Essay Contests for 1945

The First District Dental Society of the State of New York invites the preparation and submission of essays to compete for the Lord and Chaim Prizes.

Annually, at the discretion of the Board of Directors of the First District Dental Society of the State of New York, awards may be made from funds available for that purpose through the beneficence of the late Morris L. Chaim and Benjamin Lord.

The Morris L. Chaim Prize of $250 is offered for a meritorious essay on research in dentistry or any of its specialties. The essay may deal with the fundamental science provided the work has a definite bearing on some dental problem. The Benjamin Lord Prize of $150 is offered for a meritorious essay on a practical or clinical phase of dentistry.

Eligibility: Members in good standing of any recognized dental, medical or scientific society in the United States or other countries, or duly registered students of a recognized educational or scientific institution, may compete.

Date: Papers must be submitted prior to September 1, 1945 to the First District Dental Society, Hotel Pennsylvania, New York 1, N. Y.

Manuscripts: Each prize is available annually for an original paper, not previously published or read and, conforming with the conditions stated above, submitted in manuscript form, during the calendar year for which the award is made. Papers submitted shall be in English, typewritten, double spaced and accompanied by the necessary photographs, drawings, diagrams, tables and, bibliography in form for publication. The name of the author shall appear under the title of the paper.

Award Announcement: Announcement of the awards for any calendar year shall be made on or before December 31 of the year in which the paper is submitted.

Publication: Papers awarded prizes become the property of the First District Dental Society, which reserves the right of publication, if it so desires. Recipients of prizes may not offer duplicate copies of their papers for publication elsewhere unless, at the will of the First District Dental Society, permission be granted.

Essays submitted but not awarded prizes will be returned to the authors.

Further information can be obtained by addressing: E. M. Davies, Executive Secretary of the First District Dental Society, Hotel Pennsylvania, New York 1, N. Y.

Foundation Offers Prizes of $45,000 for Discoveries

A series of prizes totaling $45,000 has been established by the Sugar Research Foundation, Inc., and will be awarded over a period of five years to scientists for the discovery of new uses of sugar in medicine, art, industry and technology. The awards will be made and the project will be administered by the National Academy of Sciences through its National Science Fund.

On March 1, 1946 and for each of the three succeeding years, an intermediate prize of $5,000 will be given for the most important discovery or invention. On March 1, 1950, a grand prize of $25,000 will be given for the most important discovery or invention during the preceding five-year period. The prize competition was announced by Karl T. Compton, president of the Massachusetts Institute of Technology.

CURRENT LITERATURE

Penicillin Pastilles in the Treatment of Acute Ulcerative Gingivo-Stomatitis. By A. B. MacGregor and D. A. Long.—Brit. D. J., 78:33, January 9, 1945.

Seventy-five cases of ulcerative stomatitis have been treated with gelatin pastilles containing 500 units of penicillin per pastille. Patients continuously dissolve the pastilles in the buccal sulcus without chewing or sucking. The average dissolution time was about three-quarters of an hour.

No medicaments other than pastilles were used. In twenty-four hours, the patients were asymtomatic and fetor had gone. In forty-eight hours, sloughs and acute gingival inflammation had disappeared. Within five days, improvement of all cases was such that treatment could be stopped. Photographs taken before and during penicillin treatment showed remarkable progress of healing, especially in one case ineffectually treated with chromic acid for fourteen days before the pastille treatment. In this case, spirochetes were absent from smears after twenty-four hours, and fusiform bacilli were much reduced. In seventy-two hours, both spirochetes and fusiform bacilli were entirely absent.

Four of the most severe cases were receiving bismuth and intravenous arsenicals for syphilis, and several patients had had continuous treatment with chromic acid for periods up to twenty-one days. The fact that smears from these cases showed large numbers of spirochetes and fusiform bacilli casts doubt on the effectiveness of these drugs.

Acute ulcerative gingivostomatitis of Vincent's type has been rapidly and effectively treated with penicillin pastilles. This method eliminates the damage to tissues caused by the usual caustics and escharotics. No recurrences have been seen in a five-month period. PAUL H. KEYES.

Effects of Simulated Altitudes upon the Incisor of the Rat. By I. Gersh and J. S. Restarski.—Anat. Rec., 90:191, November 1944.

Rats were subjected to decompression, a total of twenty-four times, simulating altitudes from 24,000 to 26,000 feet, three hours each day over a period of twenty-five days. Supplementary oxygen was not given during decompression. The animals were fed an adequate diet. Of a large series so treated, four animals (two male and two female) were paired with litter mate controls of the same sex whose weights were similar at both the beginning and the end of the experiment. Decalcified hematoxylin and eosin-stained sections of the maxillary incisors were studied.

The rats subjected to decompression and the control rats showed no difference in total amount of dentin, width of incremental rings, width of light and dark portions thereof and ratio of all measurable dark rings to all measurable light rings. The total number of measurable dark and light rings was greater in the dentin of the experimental animals. The most marked difference between the two groups was in the sharpness of the constituent rings and in the number of subdivisions (auxiliary rings) of the dark rings of the experimental group.

The authors believe that the presence of auxiliary dark and light incremental rings and of other changes in the dentin is an indication of disturbed calcification. Anoxia was believed to be responsible, in some way, for the changes in the dentin. J. E. GILDA.

Mandibular Contractures in Gunshot Wounds and Their Treatment. By M. M. Labyjensky.—Stomatologia, No. 2, 1943, p. 50; abstr. Am. Rev. Soviet Med., 2:271, February 1945.

Data are presented to show that fractures involving the ramus and its processes are most liable to produce contracture. Next to surgical treatment, mechanical therapy gives the best result. In general, treatment does not require any special apparatus or hospitalization. The main object should be rapid functional restoration of the muscles of mastication, especially the masseter. Cooperative medicodental treatment is advocated. J. E. GILDA.

Sodium Hexametaphosphate as an Aid in the Treatment of Periodontal Disease. By Donald A. Kerr and Henry Field, Jr.—J. D. Res., 23:313, October 1944.

Because calculus deposited on the teeth is a complicating factor in the treatment of periodontal disease, it is desirable to prevent it if possible. The following method has been successful in a limited number of cases.

In addition to regular mouth care, a saturated solution of sodium hexametaphosphate used as a mouth wash and dentifrice once daily prevents calculus and stain deposition. This solution acts as a wetting agent, making it easier to brush away food débris and stain. It also is a solvent for calcium phosphate and removes it from the matrix in which it is deposited, and the matrix material can then be brushed away.

Laboratory tests show that it is not harmful to the teeth, and clinical tests prove that it is not harmful to the oral mucosa. It is contraindicated where a large number of silicate fillings are present, because it dissolves them. DONALD A. KERR.

Experimental Intracerebral Infection of Horses, Cattle and Sheep with the Virus of Vesicular Stomatitis. By A. H. Frank, A. Appleby and H. R. Seibold.—Am. J. Vet. Res., 6:28, January 1945.

Vesicular stomatitis in horses and cattle is characterized by an acute rise in temperature followed by the formation of vesicles and erosion on the epithelium of the tongue and mucous membrane of the oral cavity. Occasionally, lesions also occur on the teats and rarely on the feet. Two immunologically distinct types of virus causing this disease are recognized, the Indiana and the New Jersey.

The virus of vesicular stomatitis, when injected intracerebrally, was found to be infectious for horses, cattle and sheep, a rise in temperature, psychic disturbances, motor irritation and paralysis resulting. The intracerebral injection of the New Jersey type virus proved lethal for horses, cattle and sheep. After recovery from a local inoculation on the tongue, a horse and cow were found to be immune to a later intracerebral inoculation, manifesting only a rise in temperature. Sheep are not susceptible to natural infection with the virus, but intracerebral inoculation with the New Jersey type resulted in the usual syndrome manifested in horses and cattle. Local infection with the virus was not established on the tongue of this species. After a local exposure to the New Jersey virus, a sheep was not immune to a later intracerebral inoculation.

The intracerebral inoculation of horses, cattle and sheep with the Indiana type virus was followed by a rise in temperature and, in two cases, a mare and colt developed more severe clinical symptoms, but all animals recovered. The greater virulence of the New Jersey type of vesicular stomatitis virus in intracerebral injections in large animals was thus demonstrated. J. E. GILDA.

Dental Caries in the Cotton Rat. II. Production and Description of the Carious Lesions. By James H. Shaw, B. S. Schweigert, C. A. Elvehjem and Paul H. Phillips.—J. D. Res., 23:417, December 1944.

The cotton rat *(Sigmodon hispidus)* was found to be susceptible to the development of carious lesions in the molar teeth when fed a purified ration containing sucrose as the source of carbohydrate. When the sucrose in this ration was replaced by dextrin, or when a ration composed of natural foodstuffs was fed, there was a greatly reduced incidence of carious lesions.

The topographic structure of the cotton rat molar probably has an important relation to the incidence of carious lesions. The deep, narrow occlusal fissures of the cotton rat molar are in great contrast to the wide shallow fissures of the white rat molars. It is deep in these fissures that the greatest percentage of the carious lesions developed.

The optimum experimental period was found to be fourteen weeks. Since the progress of decay was rapid in the cotton rat fed a ration containing sucrose, the carious lesions were not so readily observed at from ten to twelve weeks, but any extension beyond fourteen weeks allowed the lesions to become so large that extensive fracturing of the undermined cusp occurred. The cotton rat is recommended for many types of research involving the causes and control of dental caries. JAMES H. SHAW.

A Phase of Clinical Operative Teaching. By Harry B. McCarthy.—J. D. Educ., 9:125, December 1944.

Although excellent individualistic methods and technics are often developed by practitioners of dentistry, it would be highly undesirable for these men to attempt to teach their methods in the dental schools under the suggested plan, for the following reasons: 1. The student must be primarily concerned with the acquisition of basic fundamentals and is not in a position to take advantage of advanced or alternate methods. 2. One or two hours a week devoted to individualistic teaching would not permit clinical instruction, but only demonstrations to a small percentage of the students. 3. Lack of familiarity on the part of the regular clinical instructors with the methods demonstrated would lead to confusion and embarrassment when the students attempted to apply them. When advancements or improvements result from the initiative of practitioners, it is the obligation of a teaching institution to test and evaluate them temporarily, and, if they are found to be superior to the methods being taught, to incorporate them as standard teaching procedure.

Analysis of Enamel Formation in the Continuously Growing Teeth of Normal and Vitamin C Deficient Guinea Pigs. By F. Wassermann.—J. D. Res., 23: 463, December 1944.

Enamel formation in normal and vitamin C deficient guinea-pigs was studied in regard to its initiation, maintenance and termination. Vital staining and von Kossa's calcium method were used in addition to the usual methods. The changes of the enamel-forming tissues in the beginning of amelogenesis are due to the formation of the dentin, which separates the ameloblasts from the pulp so that they are forced to draw nutritive and specific material from the opposite side. This metabolic change is accompanied by the series of structural changes, which simultaneously appear at the beginning and disappear at the end of enamel production. Enamel formation consists of secretion of the so-called globular material and elaboration of an enamel ground substance by the ameloblasts. Cases of inhibition of either formation of ground substance or secretion such as occur with a vitamin C deficiency were analyzed. The structure of the ground substance, where it was not impregnated by the stainable material, did not show enamel rods in relation to each ameloblast. At the end of enamel production, the ameloblasts, though reduced in height, are still active and indispensable for changing the enamel matrix completely into hard enamel. At the time of maturation, the flow of material through the ameloblasts is again reversed. The analysis of the complex process of maturation of the enamel matrix leads to the conclusion that the short ameloblasts are absorbing cells and as such are responsible for the removal of moisture and of organic substance from the enamel. At the same time, the enamel takes up minerals through the dentin. F. WASSERMANN.

Intra-Oral Splint for Facial Palsy. By A. G. Allen and D. W. C. Northfield. —Lancet, 2:172-173, August 5, 1944.

A fundamental principle in the treatment of peripheral nerve injuries is the maintenance of the affected muscles in the position of relaxation so that they cannot be stretched by the action of their antagonists or by the force of gravity. The same principle must be applied to cases of facial paralysis. When neglected, the deformity allowed to develop in this way will persist, although the affected facial nerve may successfully regenerate.

An intra-oral splint consisting of two parts —anchorage and facial extension—was designed to provide support at the corner of the mouth. When teeth are present on the affected side, the anchorage is a close fitting cast silver splint cemented to one or two teeth in the cuspid and biscuspid region. Twin horizontal metal tubes receive corresponding rods, which are fastened in the facial extension—a small, hook-shaped, clear plastic piece molded to the exact shape of the corner of the mouth. When no teeth are present, a plastic baseplate is made to hold the horizontal tubes. The device is not conspicuous; the exact position of the angle of the mouth can be correctly maintained; the support is easily removed, cleaned and replaced; the plastic material is nonirritating, and the device can be constructed easily. J. E. GILDA.

Therapeutic Effectiveness of Penicillin in Treatment of Vincent's Stomatitis and Its Failure to Influence Favorably Certain Other Medical Conditions. By J. S. Sweeney, W. J. Morginson, R. W. Robinson and E. M. Kilpatrick.—J. Lab. & Clin. Med., 30:132-134, February 1945.

Forty-three patients with Vincent's infection were treated with 600,000-1,000,000 units of penicillin intramuscularly in doses of 25,000 units every three hours. All patients were cured. After forty-eight hours, it was usually impossible to find fusiform bacilli and spirochetes except in patients with marked caries. In these patients, organisms disappeared after prophylaxis. The oral temperature frequently rose from 99.6 to 101 F. after treatment was started. The explanation of this phenomenon is not known. Patients treated for acne vulgaris, malaria, diphtheria, mumps, myeloid leukemia, etc., were not considered to be benefited. PAUL H. KEYES.

Tuberculous Gingivitis with Report of Case. By E. W. Johnson.—J. Kansas M. Soc., 46:42, February 1945.

A woman aged 33 years complained of sore gums, sore throat, hoarseness and irregular menses. Pleural effusion had occurred four years before and was followed by ten months of bed rest. Eighteen months before admission, a small ulcer appeared on the gum above the maxillary left second incisor. Dental therapy of six months' duration was unsuccessful and the lesion spread to involve both upper and lower gums and palate. Examination of the mouth showed small superficial miliary tubercles 1 to 2 mm. in diameter, as well as small areas of granulomatous ulceration of both gums as far back as the first molars. There was bilateral anterior and posterior cervical adenopathy. The diagnosis was confirmed by histologic sections and guinea-pig inoculation of material from the gingiva and cervical glands. Treatment consisted of bed rest, high caloric-high vitamin diet, voice rest and other general measures.

The patient received 1984 R units and 1540 R units of the x-rays in the cervical areas and gums and palate, respectively. Two years after she was first seen, the patient was considered to be clinically well. J. E. GILDA.

Use of an Antibacterial Agent Mixed with a Local Anesthetic. By J. S. Lundy and A. E. Osterberg.—Proc. Staff Meet., Mayo Clin., 20:40, February 7, 1945.

It is an accepted procedure to employ local anesthesia only in an untraumatized or uninfected field and to use only sterile instruments. This preliminary report calls attention to the possible use, in some cases, of a combination of an antibacterial agent and a local anesthetic. It was found that procaine or metycaine did not destroy the antibacterial properties of penicillin against *Staphylococcus aureus*. Furthermore, the use of penicillin did not interfere with the production of anesthesia in a series of clinical tests including continuous caudal anesthesia in obstetrics, abdominal and field block and tonsillectomy and dental procedures. The possible incorporation of other antibacterial agents is suggested by the authors.—J. E. GILDA.

Production and Inhibition of Dental Caries in Syrian Hamsters. (Preliminary Observations.) By Peter P. Dale, Joseph P. Lazansky and Paul H. Keyes.—J. D. Res., 23:445, December 1944.

Preliminary studies indicate that dental caries in Syrian hamsters may be grossly and microscopically comparable to the disease in human beings. Unlike caries produced in the rat, lesions were widely distributed in both maxillary and mandibular molar teeth and developed without evidence of fracture. The molar teeth became carious when the animals were fed a nutritionally adequate diet of finely ground corn or a coarse corn ration for 125 days. As much as 50 parts per million of fluorine as sodium fluoride in the drinking water and upwards of 68 parts per million of the halogen in the food were tolerated without deleterious effects, and exerted a marked caries-inhibiting action. The type of caries produced in the hamster and the adaptability of the animal to the laboratory seem to render it superior to the rat as a subject for caries investigation. PETER P. DALE.

Preparing Specimens of Bone and Teeth for Cutting by the Paraffin Method. By F. W. Gairns.—Stain Technology, 19: 127, November 1944.

THE method of preparing bone or teeth for sectioning described involves the following steps: forty-eight hours in 1:10 formalin; twenty-four hours in 70 per cent alcohol; decalcification for several days in 10 per cent nitric acid; rinsing and transferring to 2 per cent potassium alum and after twelve hours, rinsing and treating with 5 per cent sodium bicarbonate (or lithium carbonate) for twenty-four hours; washing for from to twelve to twenty-four hours; then passing through ascending grades of alcohol to xylene. In the case of developing teeth, a slightly different procedure is recommended: fixation in Heidenhain's stain till hard tissue is decalcified; then twenty-four hours in 96 per cent alcohol (with three changes); twenty-four hours in absolute alcohol (with one change); clearing in xylene or chloroform, and finally, embedding in paraffin. J. P. GILDA.

Preliminary Survey of Pouches and Dentition of Syrian Hamster. By Paul H. Keyes and Peter P. Dale.—J. D. Res., 23:427, December 1944.

The oral cavity of the Syrian hamster is characterized by extensive cheek pouches and a polybunodontic molar dentition. The pouches are employed for the purpose of carrying food and apparently are not related to any digestive process. The incisors are typically rodent in form, grow rapidly and show considerable pigmentary variation. The molars are characterized by sharp conical cusps separated from one another by broad buccolingual sulci and deep occlusal fossae and grooves. Occlusion of the molar teeth is distinguished by cuspal interdigitation. The molar crowns are completely covered with enamel at the time of eruption. The molar teeth of the Syrian hamster appear to be more nearly analogous to human teeth than those of the albino rat. Morphologically, the crowns appear to favor the retention of fine food particles, which might render them susceptible to a carious process comparable to that found in man. PAUL H. KEYES.

Mechanism of Cicatricial Contractures of the Facial Muscles and Mandible. By V. J. Kurlandsky.—Stomatologia, No. 2, 1943, p. 42; abstr. Am. Rev. Soviet Med., 2:270, February 1945.

Of 167 patients with cicatricial injuries in the maxillofacial region, 147 showed partial fixation. Survey of these cases indicated that the limitation of motion depended upon the degree of muscle injury and length of time elapsing before treatment is begun. The condition is treated by placing the mandible in centric occlusion with a splint and then utilizing a specially constructed device that tends to increase the size of the oral aperture. In practically all cases, some increased mobility was noted and, in some, the opening was increased from 17 to 30 mm. J. E. GILDA.

Bismuth Suppositories in Throat Infections. By Samuel Silber.—J. Pediat., 25: 244, September 1944.

A METHOD of treating oral and throat infections "possessing distinct advantages over other methods," the rectal administration of bismuth heptadienecarboxylate suppositories, is said to have the following advantages: (1) ease of administration, (2) more rapid improvement, (3) more rapid defervescence and (4) complete absence of toxic effects anally, orally and otherwise.

In cases of tonsillitis, pharyngitis, gingivostomatitis, etc., treated thus, urine analyses gave no evidence of renal damage. Proctologic examination showed no anal or rectal injury. "Specific evidence" of bismuth toxicity: pigmentation, stomatitis, jaundice, dermatitis, etc., was absent. Before treatment, organisms encountered in stomal infections included: *Streptococcus hemolyticus, S. viridans* and the nonhemolytic type; *Micrococcus catarrhalis* and "Vincent's bacillus." No cultures or smears are reported to have been made after treatment.

In fourteen cases of tonsillitis and pharyngitis, recovery was effected in 2.68 days with treatment anally. Fifteen patients recovered in 6.3 days when treated symptomatically and three treated with sulfonamide recovered in 5.3 days. In four patients with gingivostomatitis, the anal treatment showed advantages "comparable to those obtained in tonsillitis and pharyngitis." PAUL H. KEYES.

Subdivisions of the Oral Mucosa. By C. F. Bodecker and consultants.—J. D. Educ., 9:130, December 1944.

The existing terminology of the oral mucosa has been confusing. A representative group of consultants and the author have accepted the following classification. As no one man was alone responsible for this work, it was decided that it should be known as the "Journal of Dental Education's 1944 Classification of the Oral Mucosa."

I. Hornified mucosa (modified).
   A. Unattached, free or marginal gingival mucosa.
   B. Attached gingival mucosa.
      1. Enamel gingivae.
      2. Cemental gingivae.
   C. Attached alveolar mucosa.
   D. Attached palatal mucosa.

II. Nonhornified, true or areolar mucosa lining the cheeks, lips, floor of mouth and covering, but not firmly attached to the bone over the apical halves of the roots of teeth.

In case periodontal lesions cause detachment of the cemental gingivae, this area is designated as "pathologically detached gingivae."

Distribution of the Enamel in the Human Tooth and Its Relation to the Histopathology of Caries. By Harry E. Frisbie, James Nuckolls and J. B. de C. M. Saunders.—J. Am. Coll. Dentists, 11:243-279, 1944.

By the development of a precise technic, it is possible to demonstrate that an organic matrix is present throughout the enamel structure of the adult human tooth. This matrix consists of rod and interrod substance, and an almost constant relation between these structures is apparent. The lamellae are considered to be groups of rods extending more or less directly from the dentino-enamel junction to the surface in which maturation of the matrix and its calcification are incomplete, or, in accordance with the development of the enamel, these tracts may cross in irregular fashion and pursue a variable course.

Caries of the enamel is a more complicated process than the solution of its inorganic constituents. The initial lesion of this pathologic process is associated with the formation of a bacterial plaque. The enamel immediately underlying the surface plaque exhibits a progressive microscopic erosion resulting in an irregularity of the tooth surface. The matrix of this area early shows an increasingly intense staining reaction and can be differentiated from the deeper normal matrix. Closely following and concomitant with this change, there is a progressive loss of structural detail of the enamel elements, and when this alteration is advanced, the matrix becomes almost homogeneous. This process is apparently one of proteolysis, presumably produced by extracellular enzymes. A penetration of the rods and interrod substance by micro-organisms may now occur along pathways of incompletely developed rods and areas of lesser calcification. The micro-organisms found occupying the deepest part of the lesion are invariably gram-positive, spheroidal forms. Channels of invasion may follow a relatively straight course to the dentino-enamel junction and establish there a secondary focus of the carious process. Proteolytic changes extend laterally along the junction, opening up the dental extremities of the rods and interrod intervals, thus establishing a retrograde spread which extends into the overlying enamel matrix.

A different appearance of the pathologic process is associated with the production of extensive caries of the matrix. In this type, multiple irregular pathways of dissemination are characteristic. Islands of virtually sound matrix become separated by these spreading and anastomosing channels until the whole matrix is broken up. When the breakdown is nearing completion, a variety of heterogenous organisms are present in great profusion. The newly invaded areas at the periphery of the lesion show relatively few organisms, all of the spheroidal type. The immediately surrounding matrix exhibits an increasingly intense staining reaction. A working hypothesis based on these observations is offered: that, with the establishment of the lesion, caries of the enamel is primarily a proteolysis of the organic matrix that arises from enzymic action of micro-organisms, which results in the liberation of inorganic salts from the protein bond.

DEATHS

ALLEN, JOE H., Parsons, Kan.; Kansas City Western Dental College, 1937; killed recently in the Philippines when the ship on which he was a prisoner of war was sunk; aged 31.

APPEL, MAURICE, Jersey City, N. J.; School of Dentistry and Oral Surgery of Columbia University, 1923; died in an accident in India. Dr. Appel was a captain in the U. S. Army Dental Corps.

BALDWIN, LYLE, Portland, Ore.; North Pacific College of Oregon, School of Dentistry, 1917; died January 15. Dr. Baldwin was a lieutenant colonel in the Army Transport Service.

BAREFIELD, THEODORE K., Meridian, Miss.; Vanderbilt University, School of Dentistry, 1892; died December 15.

BARNHART, FRED P., Evanston, Ill.; died January 30; aged 74.

BARRY, JOHN F., Manchester, Conn.; Tufts College Dental School, 1919; died January 6; aged 54.

BEACHEY, C. WOOD, Cumberland, Md.; Dental Department, Baltimore Medical College, 1902; died February 21; aged 67.

BEALE, WALLACE E., Brockton, Mass.; Tufts College Dental School, 1903; died January 13; aged 81.

BEATTY, W. B., Cairo, Ill.; Howard University College of Dentistry, 1904; died January 21.

BEESON, William H., Terre Haute, Ind.; Indiana University School of Dentistry, 1888; died January 17; aged 79.

BEIDLER, WILLIAM, Chicago, Ill.; Northwestern University Dental School, 1897; died March 1; aged 74.

BELCHER, HARRY L., Seneca Falls, N. Y.; University of Louisville, School of Dentistry, 1895; died January 23; aged 75.

BELLET, WILLIAM, Pleasantville, N. Y.; died February 10.

BENNER, WILLIAM F., Columbus, Ohio; died February 19; aged 83.

BRADLEY, HENRY, Washington, D. C.; Georgetown University Dental School; died January 13; aged 62.

BROWN, BYRON, Brooklyn, N. Y.; University of Buffalo, School of Dentistry, 1898; died February 25.

BUERSTETTA, FRANK B., Chicago, Ill.; died December 14.

CARNELL, M. C., Waverly, Tenn.; Vanderbilt University, School of Dentistry, 1905; died January 16; aged 62.

CATE, STEWART, Baker, Ore.; killed in action in the Marianas, July 24. Dr. Cate was a lieutenant in the U. S. Army Dental Corps.

CHRISTIANI, CARL A., Philadelphia, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1915; died February 20; aged 62.

CODY, CHARLES M., Dousman, Wis.; American College of Dental Surgery, Chicago, 1892; died January 13; aged 74.

CONEY, ZACHARY T., San Francisco, Calif.; College of Dentistry, University of California, 1906; died February 14; aged 59.

DAVIS, CLEMENT V., Port Orchard, Wash.; North Pacific College of Dentistry; died February 3; aged 68.

DICKSON, CHARLES B., Ashland, Ky.; Baltimore College of Dental Surgery, 1899; died January 23; aged 70.

DILLON, THOMAS A., Springfield, Mass.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1907; died January 12.

DOBBS, THOMAS HELM, Cincinnati, Ohio; University of Louisville, School of Dentistry, 1927; died February 8; aged 40.

DOOLEY, C. C., Havana, Ill.; Northwestern University Dental School, 1908; died February 5; aged 62.

DOTY, CHARLES E., Pratt, Kan.; died January 14; aged 72.

DOUGLAS, FRANK W., Miami, Fla.; George Washington University, Dental Department, 1917; died February 16; aged 65.

DUNN, MICHAEL J., Rockland, Mass.; died February 19; aged 55.

ENLOE, W. H., Ada, Okla.; Atlanta Dental College, 1896; died October 11.

EXLEY, FRANK CONE, Savannah, Ga.; Balti-

more College of Dental Surgery, 1889; died December 23; aged 82.

EVERETT, JOY HOWARD, Chicago, Ill.; died January 13.

FREEMIRE, FRANK, Chester, Iowa; died December 25.

FREENEY, CHARLES C., Kansas City, Mo.; University of Buffalo, School of Dentistry; died January 5.

FULLER, B. F., St. Paul, Minn.; University of Minnesota, College of Dentistry, 1919; died February 2; aged 52.

GILBERT, WILLIAM F., Lewiston, Idaho; Northwestern University Dental School, 1906; died November 24.

GORMLEY, THOMAS A., Providence, R. I.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1909; died February 7.

GRAHAM, WILLIAM C., Columbus, Ohio; died February 15.

HADDON, C. D., Williamston, S. C.; Atlanta-Southern Dental College, 1918; died January 15; aged 48.

HALLSTEAD, ARTHUR W., Binghamton, N. Y.; died January 26; aged 90.

HANCOCK, ROBERT L., Belle Plaine, Iowa; died February 1; aged 63.

HARRIS, CLYDE R., Ocala, Fla.; Atlanta-Southern Dental College, 1939; died July 16; aged 31.

HAZLETT, N. F., Marion, Ind.; Indiana University School of Dentistry, 1890; died February 10; aged 85.

HEIBTRESHAUSEN, ROBERT W., Crestline, Ohio; Ohio State University, College of Dentistry, 1918; died January 29; aged 51.

HINZ, ALBERT F., Milwaukee, Wis.; Marquette University, School of Dentistry, 1904; died January 30; aged 69.

HOAG, ROBERT, Long Beach, Calif.; died January 6.

HOLSAPPLE, IRA M., Janesville, Wis.; died January 26; aged 73.

HOULEHAN, GEORGE M., Stevens Point, Wis.; Northwestern College of Dental Surgery, Chicago, 1890; died February 18; aged 79.

HOWARD, GEORGE T., Columbus, Ohio; died January 21; aged 73.

JIROCH, ARTHUR C., Muskegon, Mich.; Chicago College of Dental Surgery, 1912; died January 26; aged 58.

JOHNSON, WILLIAM H., Lynchburg, Va.; Dental Department, Medical College of Virginia, 1907; died January 17; aged 65.

KAHN, CHARLES S., Chicago, Ill.; died February 22; aged 56.

KELLEY, HENRY A., Portland, Maine; Harvard University Dental School, 1888; died February 23; aged 78.

KELLY, JOSEPH E., Hopewell, Va.; School of Dentistry, Medical College of Virginia, 1913; died January 30.

KENNEY, JOHN H., Louisville, Ky.; died January 15; aged 70.

KENYON, HERMAN, Cleveland, Ohio; Western Reserve University, School of Dentistry, 1898; died February 11.

KIDD, BENJAMIN E., Birmingham, Ala.; Vanderbilt University, School of Dentistry, 1892; died February 17; aged 74.

KILLIAN, FERDINAND F., Pawtucket, R. I.; died January 7; aged 50.

KIRK, BERNARD F., St. Petersburg, Fla.; died January 19.

KRUELL, ARTHUR H., Los Angeles, Calif.; died January 17 at Pasadena Army Hospital; aged 31. Dr. Kruell was a lieutenant in the U. S. Army Dental Corps.

LAMB, WILLIAM J.; Columbia, Tenn.; Vanderbilt University, School of Dentistry, 1906; died January 25; aged 80.

LEGGETT, JUSTIN A., Dallas, Texas; College of Dentistry, Baylor University; died January 10; aged 47.

LEVINE, JOSEPH M., Mifflintown, Pa.; University of Pittsburgh, 1936; killed in action in France, September 3; aged 31. Dr. Levine was a captain in the U. S. Army Dental Corps.

LEWIS, JUDSON T., Newark, Ohio; Ohio Medical University, College of Dentistry, 1899; died February 3; aged 68.

LOCKIE, THOMAS, Pontiac, Ill.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1898; died January 21.

LOVE, ROBERT S., Blackwell, Okla.; Western Dental College, 1902; died December 4; aged 69.

LUCKY, CHARLES M., North Plainfield, N. J.; New York College of Dentistry, 1891; died in September.

MCCLOSKEY, HORACE W., Philadelphia, Pa.; Pennsylvania College of Dental Surgery, 1903; died January 29; aged 68.

MCCRARY, JAMES DIXON, Midway, Tenn.; died February 3; aged 79.

MCFARLAND, FREDERICK D., Terre Haute,

Ind.; St. Louis University School of Dentistry, 1912; died January 27; aged 62.

MEDCRAFT, HARRY B., Palo Alto, Calif.; died February 6; aged 84.

MOULTON, O. BLAIR, Evanston, Ill.; died November 14.

MURPHY, JOSEPH C., Waterloo, Iowa; State University of Iowa, College of Dentistry, 1914; died January 18; aged 54.

OGDEN, JAMES S., Bound Brook, N. J.; College of Jersey City, Department of Dentistry, 1916; died in September.

PARR, HARRY F., Indianapolis, Ind.; Indiana University School of Dentistry, 1905; died January 28; aged 65.

PETTY, W. W., Charleston, W. Va.; died February 20; aged 88.

POSTHUM, JAMES H., Dwight, Ill.; died December 28. Dr. Posthum was a captain in the U. S. Army Dental Corps at the U. S. Veteran's Hospital at Dwight.

RAMBO, CHARLES A., Klamath Falls, Ore.; North Pacific College of Oregon, School of Dentistry, 1902; died January 4; aged 72.

RHEIN, ERASTUS R., Harrisburg, Pa.; Baltimore College of Dental Surgery, 1898; died January 16; aged 69.

RITTENHOUSE, FRED H., St. Petersburg, Fla.; died February 20; aged 73.

ROOT, JOHN C., White Plains, N. Y.; New York College of Dentistry, 1891; died February 2; aged 77.

ROPER, L. L., Greenville, S. C.; died January 23.

RUSH, THOMAS O., Gadsden, Ala.; died February 8; aged 65.

SCOTT, I. F., LaFeria, Texas; died January 1.

SHENKMAN, MAX, Newark, N. J.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1934; died in October.

SKINNER, HENRY J., Boston, Mass.; Harvard University Dental School, 1912; died February 18.

STEFANSKI, CASMIR J., Detroit, Mich.; University of Detroit, 1943; died June 19; aged 26. Dr. Stefanski was a lieutenant (jg) in the Navy Dental Corps.

STEGALL, PAUL A., Atlanta, Ga.; died November 12; aged 69.

SUER, ALEXANDER P., Philadelphia, Pa.; Temple University Dental School, 1938; died from wounds received in Belgium, December 23. Dr. Suer was a captain in the U. S. Army Dental Corps.

TAYLOR, FRANK E., Malone, N. Y.; died February 14; aged 94.

TERRILL, ARTHUR H., Great Falls, Mont.; University of Michigan, College of Dental Surgery, 1912; died February 12; aged 56.

THOMPSON, RICHARD F., Washington, D. C.; Kansas City Dental College, 1912; died while on duty in London, England, February 21; aged 53. Dr. Thompson was a colonel in the U. S. Army Dental Corps.

VANDERSLICE, CHARLES M., Phoenixville, Pa.; Philadelphia Dental College, 1889; died February 3; aged 79.

VAN DORSTEN, Canton, Ohio; Western Reserve University, School of Dentistry, 1899; died February 14; aged 72.

WEEMS, JAMES MADISON, Sherman, Texas; Northwestern University Dental School, 1897; died December 17; aged 73.

WILTBERGER, HOWARD W., Allentown, Pa.; Columbian University, Dental Department, Washington, 1897; died January 21; aged 81.

WINCHESTER, FRANK W., Jackson, Mich.; Indiana University School of Dentistry, 1892; died February 10; aged 81.

WINSLOW, SEYMOUR, Santa Rosa, Calif.; killed in Watsford, England, November 14; aged 38. Dr. Winslow was a major in the U. S. Army Air Force Dental Corps.

WINTERS, MEADE E., Greenfield, Ill.; Washington University School of Dentistry, 1907; died January 7; aged 64.

WODELL, ST. CLAIR, Brookline, Mass.; Harvard University Dental School, 1910; died recently; aged 55.

YATES, JAMES R., Alexandria, Va.; Columbian University, Dental Department, Washington, 1900; died December 13; aged 75.

YOUNG, HARRY, San Francisco, Calif; died January 1; aged 83.

YUNKER, JOSEPH C., Montclair, N. J.; Baltimore College of Dental Surgery, 1912; died January 30; aged 55.

CALENDAR OF MEETINGS

National

American Association of Orthodontists, Colorado Springs, May 21-24. **Max E. Ernst,** 1250 Lowry Medical Arts Bldg., St. Paul 2, Secretary. (Canceled.)

American Board of Orthodontics, Colorado Springs, May 17-20. **Bernard G. de Vries,** 705 Medical Arts Bldg., Minneapolis, Secretary. (Canceled.)

Montreal Dental Club Annual Fall Clinic, October 24-26. M. L. Donigan, Drummond Medical Bldg., Montreal, Director.

Ontario Dental Association, Toronto, May 28-30. E. A. Grant, 86 Bloor St. West, Toronto 5, Ontario, Secretary.

State

Alabama: Board of Dental Examiners, Birmingham, July 2. Farrar McCrummen, Woodward Bldg., Secretary.

Colorado: State Board of Dental Examiners, Denver, June 18-22. Harry D. Stanwood, Republic Bldg., Denver 2, Secretary.

Connecticut: Dental Commission, Hartford, June 19-23. Clarence G. Brooks, 302 State St., New London, Recorder.

State Dental Association, Bridgeport, May 2-4. Earle S. Arnold, Secretary. (Canceled.)

Delaware: State Board of Dental Examiners, June 20-22. Charles R. Jefferis, Medical Arts Bldg., Wilmington, Secretary.

District of Columbia: Board of Dental Examiners, Washington, June 18. Henry A. Swanson, 1835 Eye St., N.W., Washington 6, Secretary.

Dental Society, Washington, second Tuesday of each month. J. Walter Bernhard, 1835 Eye St., N.W., Washington, Secretary.

Florida: State Board of Dental Examiners, Jacksonville, June 18-21. A. W. Kellner, P. O. Box 155, Hollywood, Secretary.

Illinois: State Dental Society, Peoria, May 7-10. L. H. Jacob, Jefferson Bldg., Peoria 2, Secretary.

Iowa: State Board of Dental Examiners, Iowa City, June 11-15. Harry G. Bolks, Sioux City, Secretary.

State Dental Society, Des Moines, May 7-9. A. N. Humiston, Higley Bldg., Cedar Rapids, Secretary. (Canceled.)

Kentucky: State Board of Dental Examiners, Louisville, June 19-22. W. F. Waltz, First National Bank Bldg., Lexington 3, Secretary.

Maine: Board of Dental Examiners of State of, Augusta, June 18-20. Carl W. Maxfield, 31 Central St., Bangor, Secretary.

Dental Society, Portland, June 14-16. Alonzo H. Garcelon, Division of Dental Health, Augusta, Secretary.

Maryland: State Board of Dental Examiners, June 4-6. Kyrle W. Preis, 700 Cathedral St., Baltimore 1, Secretary.

State Dental Association, Baltimore, May 7-8. Paul A. Deems, 835 Park Ave., Baltimore 1, Secretary.

Massachusetts: Dental Society, Boston, April 30-May 3. Evelyn F. Eaton, 106 Marlborough St., Boston, Executive Secretary. (Canceled.)

Minnesota: State Board of Dental Examiners, Minneapolis, August 27-September 1. G. R. Metcalf, Barnesville, Secretary.

Mississippi: Dental Association, Jackson, May 6-8. O. L. Colee, Magnolia, Secretary.

Missouri: State Dental Society, St. Louis, May 14-16. C. W. Diggs, Exchange National Bank Bldg., Columbia. (Canceled.)

Nebraska: Board of Dental Examiners, Omaha, June 11-14; Lincoln, August 20-23. C. A. Bumstead, 924 Stuart Bldg., Lincoln, Secretary.

New Jersey: State Dental Society, Atlantic City, May 8-11. F. K. Heazelton, 223 E. Hanover St., Trenton, Secretary. (Canceled.)

New Mexico: Board of Dental Examiners, Santa Fe, June 25-29. J. J. Clarke, Artesia, Secretary.

North Carolina: Dental Society, Pinehurst, May 7-9. C. W. Sanders, Benson, Secretary. (Canceled.)

State Board of Dental Examiners, Raleigh, June 25. Wilbert Jackson, Rich Bldg., Clinton, Secretary.

North Dakota: State Board of Dental Examiners, Fargo, July 9-12. Richard Krause, Bismarck, Secretary.

Ohio: Cleveland Dental Society, May 7-9. Homer C. Alexander, Windermere Theatre Bldg., East Cleveland, Program Chairman.

State Dental Board, Cleveland, May 21-23; Columbus, June 4-6, 7-9. Hygienists, June 5, 7-9. Earl D. Lowry, 79 E. State St., Columbus, Secretary.

Pennsylvania: Dental Council and Examining Board of Commonwealth of, Philadelphia, May 28-June 2. Hygienists, May 28-31. Reuben E. V. Miller, Dept. Public Instruction, Bur. Professional Licensing, Harrisburg, Secretary.

State Dental Society, Philadelphia, May 1-3. C. J. Hollister, 217 State St., Harrisburg, Executive Secretary. (Canceled.)

Rhode Island: Board of Examiners in Dentistry, Providence, June 11-12. Archie A. Albert, 84 Broad St., Pawtucket, Secretary.

South Carolina: State Board of Dental Examiners, June 21-23. T. C. Sparks, 1508 Washington St., Columbia 23, Secretary.

South Dakota: State Dental Society, Waterton, May 13-15. Ernest W. Elmen, Sioux Falls, Secretary.

Tennessee: Board of Dental Examiners, Memphis, June 18-22. James J. Vaughn, Medical Arts Bldg., Nashville, Secretary.

State Dental Association, Knoxville, May 14-17. E. Jeff Justis, Exchange Bldg., Memphis 3, Secretary.

Vermont: State Board of Dental Examiners, Montpelier, June 25-27. Charles I. Taggart, 139 Bank St., Burlington, Secretary.

State Dental Society, Burlington, May 23-24.

Virginia: State Board of Dental Examiners, Richmond, June 19. John M. Hughes, Medical Arts Bldg., Richmond 19, Secretary.

Washington: State Dental Association, Spokane, June 21-23. G. D. Williams, Paulsen Bldg., Spokane, President.

West Virginia: State Board of Dental Examiners, West Liberty, June 25-27. R. H. Davis, Goff Bldg., Clarksburg, Secretary.

State Dental Society, Charleston, May 21-23. M. H. Nicholson, Bluefield, Secretary. (Canceled.)

Wisconsin: State Board of Dental Examiners, Milwaukee, July 9-13. S. F. Donovan, Tomah, Secretary.

State Dental Society, March 19-21. (Canceled.)

INTERNSHIPS, EXTERNSHIPS, RESIDENCIES AND FELLOWSHIPS

California, University of, Research Assistant, July 1. Willard C. Fleming, College of Dentistry, Medical Center, San Francisco 22, Dean.

Eastman Dental Dispensary, Rochester, N. Y. Director, Harvey J. Burkhardt.

Greater New York Conference of Hospital Dental Services. Secretary, Mary E. Reilly, 386 Fourth Ave., New York.

Research and Educational Hospital, University of Illinois Medical Center. Address Dean, University of Illinois, College of Dentistry, 808 S. Wood St., Chicago 12.

Walter G. Zoller Memorial Dental Clinic, University of Chicago. Address Director, Walter G. Zoller, Memorial Dental Clinic, University of Chicago, Chicago 37.

Pathology, Dental and Oral, Fellowship in, Army Institute of Pathology. Address Director, American Registry of Pathology, Army Institute of Pathology, Army Medical Museum, 7th and Independence, S.W., Washington 25, D. C.

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